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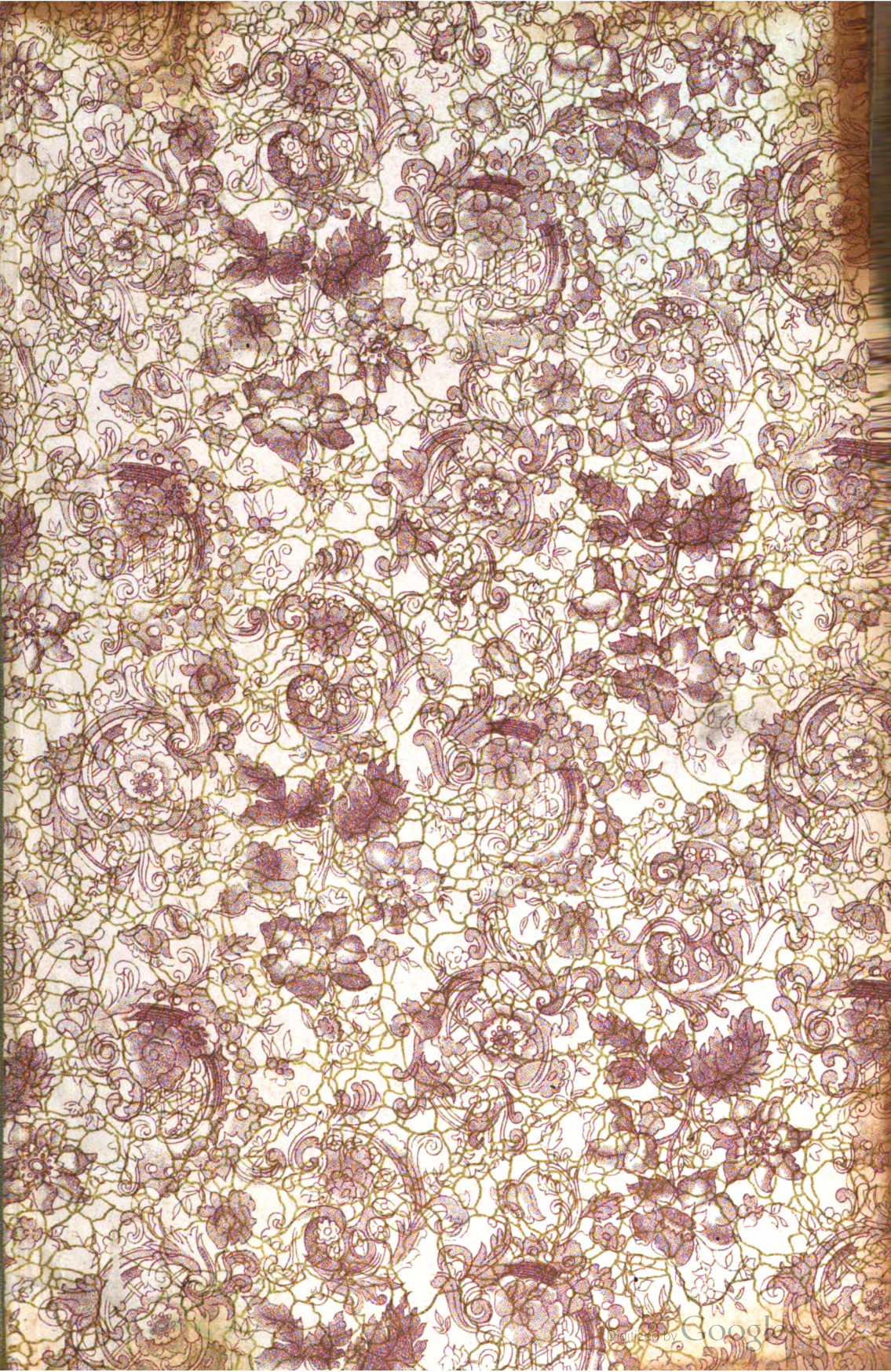
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# THE GEOGRAPHICAL JOURNAL



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# The Geographical Journal.

No. 1.

JULY, 1908.

VOL. XXXII.

## ADDRESS TO THE ROYAL GEOGRAPHICAL SOCIETY, 1908.\*

By the Rt. Hon. Sir GEORGE TAUBMAN GOLDIE, K.C.M.G., D.C.L.,  
F.R.S., President.

As this annual meeting is to be immediately followed by a special meeting to consider a change in our bye-laws, for which purpose the presence of at least a hundred Fellows is necessary, and as one cannot reasonably ask from you an inordinately prolonged attendance here this afternoon, it is necessary for me to reduce materially the length of the annual address from that usually adopted both by my predecessors and myself.

Let me first deal briefly with certain questions connected with the growth, both in quantity and quality, of geographical education in this country. Our older Fellows know that the successive Councils of the Society have, especially during the last quarter of a century, made strenuous and unceasing efforts to revolutionize the general position of geography in our national scheme of education. If the Royal Geographical Society had done no other work, it would have amply justified its existence by the success of its labours in this single direction. No one will misunderstand me as endeavouring to conceal or lessen the credit due to our great universities, to other institutions or associations, or to individual geographers not directly connected with our Society, for the important part that they have played in the remarkable movement of the last twenty-five years, which has gradually transformed geography from the Cinderella of the sciences into a respected and sought-after branch of human knowledge; but I fear no contradiction when I assert that the Royal Geographical Society was the initiator, and has been the constant mainspring of that great movement. In my

\* Delivered at the Anniversary Meeting, May 25, 1908.

address a year ago, I brought to your notice the efforts we were then making to secure for our subject its proper place (which it had never before had) in the Civil Service examinations, and I indicated the reasons for attaching very high importance to this question. Since then, as you know from the Press, our efforts have been completely successful, thanks to the cordial co-operation of certain of our great universities, and to the wide views taken on this matter both by ministers of the Crown and by the Civil Service commissioners. The effect of this change on the attitude of educational institutions towards our subject is already considerable. It cannot fail to be both widespread and deep unless the instinct of self-preservation should lose its force, which I see no reason to anticipate. Before I leave the subject of education I would remind you that quite recently the University of Edinburgh has established a readership in geography, and that the first occupant of that chair will be our distinguished Fellow, Mr. Chisholm, whose absence from London will be constantly regretted by our Society, and that the University of Sheffield, under the care of its vice-chancellor, Sir Charles Eliot, and with the aid of that liberal citizen, Mr. Allen, has established a lectureship in geography, the first selection for which has not yet been made public. Lectureships in Glasgow University and other parts of the country are, I believe, likely to be established before long. I must also refer briefly to an effort now being made by that strenuous and able geographer, Mr. Mackinder, to establish an effective London School of Geography, mainly for teachers, within his highly successful School of Economics. This effort has the most cordial moral support of our Society, and though the many and varied calls made upon its limited means prevent the Society offering to Mr. Mackinder's scheme direct pecuniary support, yet we feel that the relatively small capital sum which is required to equip the proposed geographical department will be obtained without difficulty.

I will now deal concisely with the main features of exploration during the last twelve months.

Perhaps the most notable event has been the departure of the expedition, under Lieut. Shackleton, for the resumption of work in the Antarctic Regions. He has safely landed, with all his staff and his equipment, at a point near the old headquarters of the *Discovery* Expedition. There is reason to believe that Mr. Shackleton will soon be followed by other expeditions. Dr. Charcot will take his departure in August, his main object being to explore the region between King Edward VII. Land and Graham Land. Dr. Bruce is endeavouring to obtain funds for a fresh effort, and there is reason to believe that other expeditions are in contemplation; so that, within the next three or four years, we ought to have made very solid progress towards the solution of the remaining unsolved problems of Antarctic geography. During the last twelve months the Natural History Museum has issued

a volume of the scientific reports of the National Antarctic Expedition, and other volumes may be expected very shortly. Our Society has just issued the admirable charts of the expedition which have been prepared by Lieut. Mulock.

Turning to the North Polar Region, we have to note the return of Mr. Harrison from his attempt to penetrate into the Arctic ocean, with the expectation of discovering a great extent of land. He was unable to carry out his scheme completely; but he has contributed considerably to our knowledge of the oceanic conditions between the mainland and Banks' Land, and has also done valuable survey and other work along the Arctic coast of America. Mr. Mikkelsen, who had the same end in view, has met with various disasters, which have unfortunately prevented him from accomplishing his designs. Dr. Bruce has given to the Society an address on his work in Spitsbergen, under the auspices of the Prince of Monaco. On the other hand, the Duke of Orleans has been unable to favour us with his promised lecture on the important researches which he accomplished in the Novaya Zemlya region.

Asia is so overrun with expeditions of all nationalities that only very brief reference can be made to them. Dr. Sven Hedin is pursuing his successful career as an explorer of the unknown and less known regions of Tibet and Central Asia. He will have a rich harvest to lay before the world on his return, which, it is hoped, will be this year. There is every likelihood also, that our accomplished Fellow, Dr. Stein, will return this year, to tell us the story of the remarkable discoveries which he has been making in Eastern Turkestan and the borders of China. As Dr. Stein's work is always of the most thorough character, and as he has the assistance of that able surveyor, Ram Singh, his contributions to geography are likely to be of the highest value. I would draw your attention to the publication, during the past year, of Mr. Ellsworth Huntington's remarkable book, entitled "The Pulse of Asia," a work of great interest to those who wish to realize the important bearing which geographical conditions have had on human history and human enterprise in Central Asia. Our knowledge of the Himalayan regions has been considerably extended during the year by the explorations of Dr. and Mrs. Workman, of Dr. Longstaff, and of Messrs. Rubenson and Monrad Aas, and we may expect further important additions to our knowledge of Central Asia from the expedition on which Captain Kozloff has recently set out, while we shall be interested to see the detailed results of Dr. Tafel's work in Eastern Tibet. You may be interested to know that the Society has now in hand, with the assistance of Colonel Maunsell, a new map of the whole of Turkey in Asia.

Africa is still flooded with explorers; but, as might be expected, these explorations are becoming of a more and more special character,

seeing that the pioneer work has been practically accomplished. The French, especially, are showing praiseworthy zeal in the exploration of the Sahara, and one of the most interesting expeditions of the past year was that of M. Felix Dubois, across the Sahara to the Niger. Not less important was that of Captain Arnaud, from Algeria to the coast of Dahomey. Captain Lenfant has been doing excellent work between the French Congo and Lake Chad. Dr. Leo Frobenius has entered upon an expedition likely to be fruitful in results from Senegal (by the upper Niger) to the Lower Niger and the Kameruns. In East Africa, Dr. Jaeger has been doing careful work between Mount Kilimanjaro and the Victoria Nyanza. Further south, the elaborate expedition under the Duke of Mecklenburg is covering the ground about Lake Kivu. Our own Society has given substantial support to an interesting piece of work in connection with the Anglo-Belgian Survey in the Ruwenzori region. By the sanction of the authorities, the British members of that expedition have been allowed to undertake the geodetic measurement of a section of the arc, which it is hoped will ultimately be included in a complete geodetic network from the Cape to Cairo. Finally, so far as Africa is concerned, I will draw attention to the remarkably able paper contributed to the *Journal* by Mr. Lamplugh on the Gorge of the Zambezi river.

In South America, Major Fawcett has been re-engaged by the Bolivian Government to carry out the work of delimitation along the frontiers of that country. From the original maps which he has placed at our disposal, it is evident that he will carry out this delimitation with complete competency, and that when his operations are completed, he will have added substantially to our knowledge of the geography of that particular region. Major Fawcett's map will be of great service in the preparation of a new map which the Society has undertaken of a section of South America, embracing part of Bolivia. So far as Central America is concerned, Dr. Tempest Anderson's interesting paper on Guatemala must have been to many of us a revelation as to the real character of the physical geography of that Central American country. At the southern end of the continent, we learn, from communications which have just been received from Dr. Carl Skottsberg, that as commander of the Swedish Magellanian expedition, he has been doing excellent work, both in Tierra del Fuego and in the Falkland islands. I may, perhaps, remind you that the Surveys of Canada and of the United States are rapidly mapping the whole of those regions, while excellent work of the same nature continues to be done by Argentina and by Chile, and, we have reason to believe, by Brazil.

The same may be said of Australia, the various states of which have competent Surveys, although there still remains a considerable amount of pioneer work to be done in the interior, and in this respect the journey of Mr. Canning across Western Australia deserves to be mentioned.

The Society during the past year has contributed to an expedition which is at work, under Mr. Rivers, on the island of Guadalcanar, in the Solomon group, from which we expect interesting results in anthropogeography. No less interesting results may be expected from Mr. Louis Becke, whom the Society has also subsidized, and who intends to take up his residence for a considerable period in Bougainville island, one of the same group. Mr. Becke will have with him a competent New Zealand surveyor.

I have not time for more than a cursory reference to the subject of geographical research. At our ordinary meetings we had Dr. Nansen's lecture on North Polar Problems, Mr. Mackinder's on the Geographical Conditions affecting the Development of the British Empire, Mr. Chisholm's on Inland Waterways, and Mr. Gomme's on the Story of London Maps. Nor must I omit to mention Dr. Mill's six lectures on the "Geographical Distribution of Rainfall in the British Islands," which were so highly appreciated and so well attended that they had to be given in the usual hall instead of in the map-room, as was originally intended. Our Research Department has had before it such subjects as Dr. Woolacott's investigation of the "Origin and Influence of the Physical Features of Northumberland and Durham," Dr. Owens's paper on Sea Currents, Lieut. Vivian Thompson's account of the very successful method of Stereo-photo Surveying, Mr. Reeves's account of his New Distance Finder, and the report by Dr. Strahan and his colleagues on their Rivers Investigation.

Those who desire fuller information, either as to the progress of exploration or our Society's efforts in geographical research, will find it in the pages of our *Journal*, which, owing to the labours and experience of Dr. Scott Keltie, continues to hold its position, acknowledged by the highest geographers of other countries, as the first geographical journal of the world. And I desire to take this opportunity, which I may never again have, of once more emphasizing the great debt which geography in general and this Society in particular owe to Dr. Keltie's labours, whether as editor of the *Journal* or secretary of our Society. The same reasons impel me to bring before you again to-day the valuable services which continue to be rendered by the other heads of departments; Mr. Reeves, in his triple capacity of cartographer, map curator, and instructor; Mr. Heawood, as a most admirable librarian; and Mr. Evis in the post of chief clerk, which he has held for a quarter of a century, to the great advantage of the Society. Nor can I leave this chair without a just tribute to the numerous officials who work under these three heads of departments. It is in no spirit of empty compliment, but with a just appreciation of the experiences of three years of constant observation, that I assert that the Royal Geographical Society is well and zealously served by all in its house.

## EXPLORATION IN SOUTHERN NIGERIA.\*

By Lieut. E. A. STEEL, R.A.

DURING the years 1904 to 1908 a large tract of hitherto unexplored country, roughly an area of 3500 square miles, in the hinterland of Southern Nigeria, has been brought under Government control. The part dealt with in the following pages is that portion between the Niger and Cross rivers (with the exception of a narrow strip along the banks of the latter), and north of the Bende-Owerri road. This portion has never before been visited by any white man, or even any responsible black man, as far as could be ascertained, and owing to the reluctance of the various tribes to admit any one into this country, expeditions are very necessary to enable any progress to be made at all. Furthermore, the tribes delight in attacking those surrounding tribes who have been brought under control and disarmed, and are thereby an easy prey for them. This state of things naturally cannot be tolerated, and consequently, before any useful results can be obtained, this process of "disarming" has to be gone through, which they only submit to sometimes after considerable resistance. Further away to the north are still more pagan tribes of whom very little is known at present, except their reluctance to have anything to do with the Government, or allow any one into their country: that they are full of self-assurance is evident from the insolent messages and presents of guns and gunpowder which often arrive by emissaries for the nearest political officer, expressing the hope that the "white man" will "now" not fear to come, for "we are ready to fight him." The most dreaded of these tribes, at any rate by their enemies, are the Munshis on account of the deadly poison with which they smear their arrows. Its effect is so deadly that death invariably ensues within a few minutes after the arrow has pierced the skin.

Another warlike race are the Ihnis, directly bordering on the area about to be described, but these tribes will require "individual attention" later on on account of their intractability, and their southern boundary has so far always been the northern limit of any active operations, on account of the enormous area affected should they be interfered with. *Festina lente* is the rule in these parts. So, to return to the area and people under consideration, having neighbours of this description, it is not to be expected that they themselves should be much better.

The people of this region may, as a whole, be described as savages. They all are related in some way or other to the Ibo race, which is the predominant race east of the Niger, though the several tribes met with each has its own dialect. Those bordering on the Niger and Cross rivers, who have had the advantage of coming into contact with civilization,

\* Read at the Royal Geographical Society, March 9, 1908. Map, p. 120.

and are supposed to be under Government control, only continue their barbarous customs secretly; but as we gradually get further inland so do the people become worse, until we get to the Onichas, Ahiaras, Obowus, and such like, amongst whom human life is held extremely cheap. But before proceeding to describe their country and characteristics, it is necessary to say a few words about the "Aros," who are scattered all over this part, sometimes in twos and threes, sometimes in settlements, from the Cross river to the Niger. Their influence is predominant over these pagan tribes, and as they have no good to say about the Government, their presence is a continual thorn in the side of the administration. They derived their power from the notorious "Long Juju," situated in a ravine near Arochuku, and no important dispute could be settled save by reference to this oracle. As the tribe supposed to be specially favoured by it, the Aros were able to make gain of it, both by propitiatory offerings and slaves. It also gave them power to penetrate and work their baneful influence upon these superstitious tribes of the interior, who otherwise would admit no strangers to their country, and also the power of removing any one opposing or "even desirous of opposing" their authority. This dreaded Juju oracle at Arochuku was destroyed during the military operations of 1902, but not so the Aros, who immediately gave proof of their superior intelligence and "power" by adapting themselves to the new conditions of British administration, and living by the proceeds of systematic blackmail on the easily beguiled natives. This is one of the chief difficulties that an exploring expedition has to contend with, for it takes years of tactful administration to dispel this Aro influence. These latter are easily distinguished by their intelligence and superior clothing from the local natives. It would be very interesting to know the past history of these Aros. How came they to be considered specially favoured by the Long Juju, and also superior to all their neighbours, both intellectually and physically?

Having thus described the "influences" which were already at work in this region before our arrival, and the tribes on its borders, let us return to Onicha, on the banks of the Niger, which was then the headquarters of that portion of the Protectorate, and from where the first expedition, consisting of about three hundred officers and men, made its start. The portion allotted was a stretch of country from Ogrugu to Oguta, and about 25 miles inland from the Niger, over 1500 square miles. Most of this was unknown, the inhabitants refusing to permit either Europeans or native traders into it, though they carried on a considerable trade themselves through middle men with the various "factories" on the Anambara creek, Niger river, and Oguta lake. A start was made from Ogrugu, on the Anambara creek, in November, in a southerly direction, and a halt was made at a town called Obukpa, the most important in the district, on the second day. From here small

parties were sent out, once opposition had ceased, and the country mapped by means of compass and measuring wheels. Having more or less fixed points in Ogrugu, Onicha, and Oguta, the work presented little difficulties, and in January an advance was made to Enugu. Here the main column stayed a couple of months, carrying on the work of mapping, and a site for a new station was chosen at Oka, 25 miles east of Onicha. February and March were spent at Umugi, and the country between it and Oguta mapped. This part of the country was found to be very low, and is inundated during the rains. Owing to the dense population and thick nature of the bush, and there being no roads, this work of mapping was very slow, for it is quite easy to pass within a few hundred yards of a village and not know of its existence. It was quite impossible at any time to get a view at all, or any compass bearing of distant objects.

In April the work of the column ceased, owing to the hot weather and the rains, when travelling is impossible, with the exception of consolidating the work done, correcting names of towns, settling tribal boundaries, etc., till the following November, when a large expedition of over seven hundred rank and file was concentrated, half at Oka, and half at Bende. The map being a blank, no definite instructions could be given as to the route to be followed by each column. The initial idea of the officer commanding was that each column should start at the same date from these two places and effect a junction at some suitable imaginary point, Z, the bearing of which from each place was settled beforehand. The point Z was chosen with due regard to political and geographical reasons. It should, if possible, be on the northern boundary of the Ahiaras and Onichas\* and Obowus, which would facilitate dealing with these truculent people, as it would then, with Bende and Owerri to the south, form a triangle of posts round the country; it should also be fairly central for mapping the country, and, if possible, situated on the river Imo, which was known to run through these parts, and which forms the eastern and western boundaries of the tribes along it. The column from Oka, moving in a south-easterly direction, passed through magnificent undulating country, fortunately meeting with little active resistance. No halts were made except for the night, when the day's route was mapped and the approximate position noted. The method of sketching employed, viz. with prismatic compass and "perambulator" wheel, proved very satisfactory, as the latitude and longitude of Onicha and Bende were fairly accurately known. After five days' marching this column arrived at Z, the actual meeting being facilitated by means of star shell, which were fired at night by the Bende column from Z, where it had arrived two days previously. Its progress had not been

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\* Onicha, Onitsha, or Onitcha, is a very common name in these parts. They have nothing to do with each other.

so uneventful, for two days' march outside Bende the natives of Nkpa set up a stout opposition. They were easily driven out of their stockades, but the question of guides became serious. Even when a native was caught, he professed to know nothing about the next town, either its name or the way to it, saying he had never been out of his own compound. This to a certain extent was found to be true, for in these parts it is as much as any native's life is worth to leave his own village. He is kidnapped and sacrificed, and then tied up on to a sacrificial stake in the market-place in order to keep the "white man" out. Consequently there is no trade, no paramount chief; each village being



ONICHA LANDING-PLACE ON THE NIGER RIVER.

entirely on its own and ignorant of its neighbours. They do not fight each other—they are too great cowards for that—but simply lie in wait for any unfortunate neighbour who happens to stray beyond his boundary. Consequently, the third day out the column had to find its way in the dark, as it were, a halt being made every few hours to plot out the position on the map. An advance was then made by the bush path whose direction seemed to correspond best with the bearing of Z. By midday the column arrived at a large market, where a human sacrifice had just been completed. Here a halt was made, and as it was imperative to catch some one who could tell us where we were, a party was sent out for this purpose. A tremendous noise began on all sides, guns going off, war-horns being blown, to call every one together, and shouting, this being to frighten us away. Eventually the party returned

with a very decrepit old woman (the men had all run away), who, as soon as she was calmed (for she thought her last hour had come), informed us the place was Omobialla; but she knew nothing of the next place, which, according to her, contained "very bad" people. She also informed us their boundary was the great big river a little way further on, past which none of them ever dared to go. When asked who had sacrificed the human being in the market-place, she said they never did "such a thing," and it had been done by a neighbouring tribe in the night, so as to get them into trouble, and also because they thought their "Juju" wouldn't let the "white man" pass through if they sacrificed to him! So having admonished the old lady to guide us properly, the column advanced. The river she had spoken of was no doubt the Imo, and here we should find Z, be able to link up with the Oka column, and shake off the uneasy feeling of wandering about in a hostile country, not knowing where we were.

After half an hour's march along a gradually descending path through dense bush, the column reached the river, which was here unfordable, and only to be crossed by a rotten suspension bridge of tie-tie, which the natives on the opposite bank were just beginning to cut down. We had surprised them, so they contented themselves with keeping up a heavy fusillade from the opposite bank, and were only driven off by a large party crossing by a ford higher up and taking them in flank. It was late in the afternoon when the column crossed over, and here, in a nice clearing, we formed a camp, which from our map turned out to be approximately Z. Here we had to wait till the Oka column arrived, the time being spent in making a large base camp, trying to get information of the surrounding country, and guides. It was most difficult. Every native we happened to catch "of course" had never been outside his village. All they knew was that every one all round were "very bad" people. On the fifth day the Oka column arrived, but our plans were at this time altered by the news that Dr. Steward, who was starting from Owerri to go to Calabar, had taken a wrong road, and ridden on his bicycle into the very Ahiara and Onicha country, i.e. north of the Bende-Owerri road, which we were about to deal with, and had been cruelly murdered. Consequently the whole attention of the columns was concentrated on this portion first, viz. the triangle Bende-Owerri-Z.

It was not till the end of February that this portion had been properly mapped and pacified, as well as a portion eastwards, and a start westwards was then made. The objective was the Awo country. Here another camp was made, and a small column left to map this portion and join it up with Oguta and Owerri, whilst the headquarters and remainder marched north, and another base camp was made at Eziam, which the Oka column had passed through in November. The river Imo was found to be very much smaller here, only about 3 feet

deep and 20 feet wide. This river, called the Opobo in its lower reaches, is one of the largest in South Nigeria, and consequently the finding of its source, according to the natives quite close, was an object of especial interest. With this object in view, a party went out, and after marching 7 miles across hilly country, the town of Omaka was reached. On the far side we suddenly came to a deep ravine; descending the precipitous and thickly timbered ground, we found a huge rock, at the base of which three springs welled out, converging in a few yards into one. This rippled over the rocks for a few yards, then fell clear away some 30 feet, and ran away down the ravine.



WASHING DAY ON THE NIGER RIVER.

At the bottom of the waterfall were numbers of Juju houses with painted guardian images, supposed to protect the waters. The whole was fenced round with the utmost care, for the natives hold it in the greatest awe and superstition.

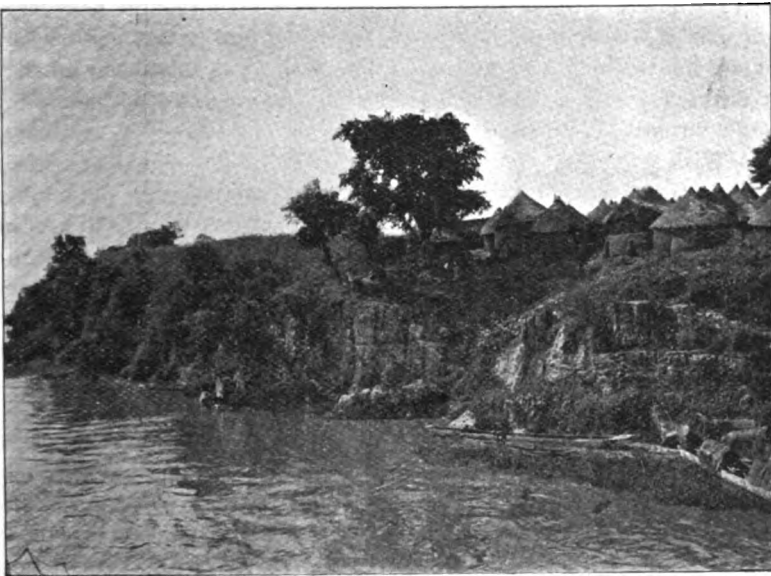
The next two months were spent in sketching the country round Eziam, and joining up the surrounding country we had already done. On April 30 operations ceased, for the hot weather had set in; besides, every one had been six months hard at it, and all were beginning to show signs of fatigue. A site was chosen at Omoduru for the new station, from which this district was to be administered, and the expedition broke up, one company being stationed at Omoduru, to look after the newly pacified tribes. During the rainy season, June to September, no fresh work was possible. During the dry weather 1906-1907, several

small parties were continually out consolidating the work, which had been already done somewhat hurriedly—necessarily so when under active service conditions. The names of several towns which had been put down wrong the previous year were corrected, and, most important of all, the tribal boundaries were all settled. A little piece north-east of Eziam, up to the Ihni boundary, was further mapped, this marking the limit possible, for the Ihnis don't intend to let any one sketch their country without a fight.

*Relief of Land.*—What is the nature of this country between the Niger and Cross rivers? It may be summed up in a very few words. It is entirely bush country, though perhaps not so dense in some parts as nearer the coast, and open patches used for cultivation here and there are met with. No view of any of the country was obtained until we arrived in the Uтуру district to the north-east. Here the character changes. Hills of from 1000 to 2000 feet and grass country, and low scrub with an occasional patch of forest, relieve the monotony of the gently undulating bush country, and the accompanying suffocation that seems to pervade it. Mountains there are none; the highest known hills (Oban hills) in the colony are barely more than 2000 feet high, and standing on one of these hills in this Uтуру country a superb view is obtained—a great forest occupies the valley in the foreground; no village or farm-clearing, not even a solitary hut, intrudes upon the vast loneliness of the scene. Away to the north and north-east, as far as the eye can see, rise innumerable peaks, probably reaching 5000 feet in at present unknown country, predominating over the lonely valleys that lie at their feet, while in every other direction the whole land is enwrapped in an impenetrable mantle of bush and forest growth that characterizes the West Coast. Here we had found indeed the dividing line. There is only one river of any importance in this area, the Imo, the source of which we discovered. This river never dries up, and always has a respectable flow. In the rains it swells tremendously and overflows its banks for miles. There is, however, nearly always water to be found everywhere; small streams which rise very suddenly and are to be found in almost every depression in the ground, owing to the tremendous rainfall and the saturation retained in the "bush." Two other rivers, the Njaba and Orashi, were both traced to their source, and were found to end in a succession of pools in the dry weather. They both flow into the Oguta lake, and in the rainy season the Orashi, which flows on into the Niger, swells to such an extent that large steamers come up into the lake and carry down the year's supply of palm oil that is collected at Oguta.

The soil in most parts is distinctly fertile, being a rich reddish loam, which is improved by being manured by a wood-ash produced by the periodical burning of the bush. This is general all over the country. On the slopes and summits of the hills the surface is scattered over with

many stones and boulders of rock, and in the Uturu and Bende district an extensive series of sandstone and igneous rocks were met with. The soil in all the marshlands and lowlying parts is black with successive layers of decayed vegetable matter. This whole area may be described as decidedly poor in vegetable products. There is practically no timber of any size or importance, except in close proximity to the banks of the Niger and Cross rivers. Here nature has thoughtfully supplied the mahogany, awosa, and oroko tree. The two former are used by the natives for making their canoes, while the oroko tree supplies the timber for every kind of building in the colony. Towards the Cross river side are also to be found ebony and camwood. A con-



ON THE CROSS RIVER.

siderable trade is done in the latter, its red dye being used to paint the body in certain social and religious observances. Rubber is confined to the same area; it is practically unknown in the interior. Here, too, we see the number of the oil palms—that source of wealth of the whole West Coast—gradually diminishing. Towards both these mighty rivers it flourishes abundantly; but as we trace it towards the interior, and also northwards towards the Uturu and Oka country, so it gradually diminishes, and the natives only obtain enough for their daily consumption. The cotton tree is common all over, nearly every market-place having an enormous cotton tree. At its base the trunk throws out huge buttresses, sitting on which the young “men” spend most of the day, smoking and drinking, while their “mammies” do the work. Fruit

trees grow all over, though their products are inferior to those grown by more civilized tribes. These include the banana, coconut palm, lime, pineapple, plantain, and paw-paw. In the interior the pineapple grows wild, and borders both sides of the bush paths where it is not suffocated by the overpowering bush. These pines, though, never become palatable to the European. Fields of ground-nuts are cultivated in several parts. Maize is cultivated everywhere in small patches, and generally in conjunction with yams, chillies, cassava, and coco-palms, for the native likes to grow everything he wants in the one piece of land he has cleared for the production of the season's supply of yams, the staple food of these people. Sugar-cane is also indigenous.

Southern Nigeria is a poor hunting-ground—this portion especially so. Very few elephants have ever been seen here, though very large herds exist in the delta regions to the south and also to the north, where they are hunted by Hausa hunters. The West African baboon inhabits the forested portions, and is described by the natives as being big enough to kill an unarmed man. Such a one, however, we never saw. With some they are looked on as sacred. The Anambara creek, on the extreme west of this area, affords the best shooting obtainable, and here the hippopotamus and buffalo are met with. At times we came across a few herds of bush-buck and a fair amount of francolin and Guinea-fowl, but taking it all round it was a very poor game district. None of the larger buck (*Cobus Cob*) met with much further east were seen. Their domestic animals include very inferior goats, sheep, cows, pigs, and fowls.

White ants abound, the queen and the cell in which she is encased being often brought for sale, and are eaten by the natives in these parts. They are a terrible scourge, and no wooden structure seems proof against them. The driver-ant, too, is a great nuisance; these creatures travel in immense hordes, and are so destructive of all living creatures that come in their way that they drive everything before them. One morning we found our chicken-run entirely denuded of chickens by a midnight raid of these insects during one of their migratory periods, and another night we were all awakened by the noise of the goats and sheep, about fifty, which were attacked in their pen. We only managed to save a few of them.

The typical characteristics of the various tribes in these parts are, in the main, those which are common to all savage peoples. Their average physique is decidedly inferior to other black races, though, being almost nude, they appear to be taller and bigger than they really are. There are some exceptions, and the reason for these can be attributed to the influence of geographical conditions, or their different modes of life. The natives of the Onicha and Oguta districts on the Niger are tall, well shaped, and active, no doubt due to their more energetic life, for they are keen traders and good watermen. The

colour of their skin is a dark chocolate, freely marked with tribal cuts. Here and there one has a coal-black skin, which is much admired by the natives themselves, and, being kept clean by daily baths, is smooth and shiny. The Oka people, bordering on the Onicha district, and the Bende people in the south-east of this area, and the Elugus to the east, represent also fine specimens of natives, and this may in a way be due to the comparatively hilly nature of their country—Bende particularly so. Oka, which was established in 1905, is also the head-



WOMAN FROM THE INTERIOR, AHIAARA COUNTRY.

quarters of a very large community of blacksmiths and coppersmiths, and men from here are found in the most distant parts of the Protectorate. The Bende natives are well known everywhere for their extraordinary physique, and are used in preference to any others as "carriers." If there is any manual labour required, such as for road-making and clearing forest, it is always more economical to bring a few hundreds of Bendes than any amount of local labour. These people have few of the characteristics of their neighbouring tribes. They are

extremely tractable, hard working, and civil; they hardly indulge in barbarous customs, their faces are barely marked, and they have few superstitions—ideal qualifications indeed in a savage race, but, unfortunately, there are too few of them, for their country only extends over an area of about 300 square miles. Here again is an interesting study. How came these people, surrounded by the most despicable savages in the world, to be so superior? Surely it cannot be due entirely to the advantage they have of living in a hilly district. The other tribes, which include the Ahiaras, Onichas, Obowus, Nkwerris, Awos, and which occupy the interior, are in a very low ebb of civilization. Their skin is much lighter than usual, being of a dirty mud-colour. They have no occupation, for they won't indulge in trade, and the surrounding tribes will have nothing to do with them. However, since their country produces their daily wants, which are few, they are able to do without their patronage.

The work of cultivating the ground just sufficient for their needs is done by the women and children, while the men do nothing but eat and drink and sleep and enjoy themselves. They have no physique, no intelligence; their habits are of the dirtiest description, and nothing gives them so much pleasure as the sacrifice of human blood. At sunset the day for these people begins. It is then that the young men go out to fetch their pots of "tombo"\* (or palm wine) down from the trees (they will not trust the women to do it), and on their return it is carefully put away to ferment. When it is dark the fun begins, and the night is spent in drinking and dancing to the accompaniment of tomtoms. In the early hours of the morning they stagger to their huts and sleep on till about midday, when their food must be ready for them. After that they will proceed to one of their favourite market-places, club-houses, or Juju-houses, and gossip and smoke till sunset. When the supply of tombo is finished, an early rise is necessary to replace the pot at the open mouth at the top of the palm tree. Dancing is the only form of exercise these people indulge in.

A lot has been written about the gin traffic on the coast, and how it is ruining the natives. Amongst these last-mentioned tribes the consumption of gin is infinitesimal compared to the amount consumed by the natives in any other part of the Protectorate, and yet they represent the lowest type in every respect to be found anywhere, though they are offshoots of the predominant Ibo race. Some philanthropists would have us believe that this imported gin is the ruin of the natives and the cause of their degeneracy, yet how comes it that their brothers of the interior, to whom gin is a luxury, are far more degenerate than they

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\* This is the same as toddy in India collected by the natives from the toddy palm tree. When the oil palm grows old it gives out the palm wine, which is drawn to the top by the heat of the day's sun, and trickles into pots placed suitably for it.

have ever been? The reason is this, that this palm wine, when left to ferment, is much more harmful than any amount of gin, and far better it is that they should buy gin, which is an incentive to trade at any rate, than that they should lead the lazy life of these people, who find in this fermented palm wine an ever-ready means of immediate excitement, and under the influence of which they commit every form of atrocity.

*Festivals.*—In the main, these people keep the same festivals as those



GIRL FROM THE OGUTA COUNTRY.

in other parts: (1) The planting of the yam; (2) the eating of the firstfruits of the crop; (3) the worship of the new moon. All these are made the excuse for orgies. Various kinds of personal adornments are indulged in. The ladies of both the Onicha and Oguta districts on the west, and also of the Afikpo district on the east, spend hours adorning each other's hair. It is plastered up with palm oil and grease into most fantastic designs, and remains in that condition for months; the tribes of the interior do not indulge in any more than

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merely painting their bodies and faces by way of adornment, though both sexes have some charm either round their necks or waists, consisting of a string or strip of leather, on which are threaded either cowries, coloured stones, or human and animals' teeth: It is usual to tie something of this sort round the necks of their cattle and sheep, which is supposed to protect them. Some young girls have a stick or tooth of some animal, and in the north part, where copper and iron are smelted, a piece of metal, through the upper lip; this is supposed to favour child-bearing. The most remarkable bracelets are those of ivory, being sections of elephants' tusks, which indicate that the wearer is a person of wealth and importance. Most chiefs in the Afikpo and Bende districts, and also in the western districts, have either an ivory bracelet or anklet. Anklets of ivory, brass, copper, cowries, are worn by both sexes of the Niger and Cross river tribes, and also in the Oka and Uturu country. The interior tribes, being very much poorer, and having few relations with their neighbours, and somewhat cut off from the source of supply of these luxuries, have to be content with body-painting. Paints are made by the natives from indigenous vegetable products, black, white, red, and yellow. They are used either: (1) for ornaments before a festival; (2) as "medicine" in case of sickness, or a social or religious ceremony; (3) or during the initiation and fattening process of girls prior to marriage (this amongst the more civilized only).

A wounded man of the Onichas was once brought into camp only after his friends had been treating the wound with every colour of paint. The wound, originally a slight one, had spread all over his body as a consequence, and was incurable.

*Superstition.*—The natives of these parts are extremely superstitious, and this does not only apply to the pagans, but also to those who have been brought up in civilized surroundings. As already mentioned, most of these natives wear some kind of charm round their neck or waist in the belief that they are thus protected from illness, or death from their enemies. When, however, the talisman has lost its supposed power, and its wearer feels the hand of death upon him, he submits to his fate—he is wanted by the fetish. To many places and things they attach a superstitious veneration. The rock found at the source of the river Imo is considered sacred, and as such is carefully guarded. Every village has its sacred grove, surrounded by human skulls, chatties, and rotten eggshells on sticks. They believe that a spirit haunts the locality of a murdered man, or their sacred grove at night, and no native would pass near such a place during the darkness. Any unusual phenomenon is by them attributed to a supernatural agency. Not only has a village its good spirit, but also its evil spirit, and when any misfortune of any kind overtakes a village, a process of driving out the latter is indulged in with the help of much noise, and every one beating the walls of their huts with sticks.

When we entered this country from "Bende" in 1906, we fired a "star" shell, to try and communicate with the column marching from Oka. This was seen by the natives for miles around, and its effect was extraordinary. The Abiaras, Onichas, and their war-like friends, who had spent years building the most marvellous trenches and stockades to guard every possible approach to their country, told us they had meant to give us a very warm time, but the star shell was too much for them. Any one who could do this must be supernatural, and they fled into the



GIRL FROM THE OKA COUNTRY.

bush and kept up a guerilla warfare for months, never daring to show themselves. Others from the north, doubtful at first as to whether they should fight or not, came in to see the "white" man, and asked what they could do to be saved. As another instance, a boy of mine said he couldn't possibly come out after an elephant with me till he had been to his village and got some "medicine" which would protect him. And as a last instance, in January, 1906, when a small column was operating in the Ohonhon country, north-west of Bende, it had a lot of trouble

with a town called "Omo Oga Ngolori," the reason given being that when the Long Juju of Arochuku was destroyed in 1902, it was brought to this place as being out of reach of the Government, and the Aro priests tried to re-establish it here, and carry on their former customs. At any rate, it was reported to be a most powerful Juju, and meant certain death to any one who entered. A visit was made to it (no native would show us further than the entrance, which was an oval-mouthed cave in the rocky side of a hill). All round were sticks stuck in the ground supporting skulls, eggs, bones, while blood was splashed over the walls; on the right of the entrance was a large basin of water about 18 inches deep, hewn out of the rock, in which water trickled through from the roof, and in which a few fish glided about. These, we were afterwards told, were the same fish as were brought from Arochuku, and are held in great awe. Further on stood a large long-shaped war-drum, hewn out of a tree-trunk on the ground. On top of it was a slit, over which the necks of victims to be sacrificed were cut. Whilst examining this one of the officers made some remark, setting up a series of echoes, which resounded from the walls of the cave. It certainly was most queer, and was altogether too much for the few soldiers and others who out of curiosity had followed us in, for they dropped their carbines and fled out.

*Marital Relations.*—The marital relations amongst these peoples vary somewhat according to their state of civilization. Amongst all polygamy is the rule, the reason given by the natives being that it is impossible for one woman to do all the work of the house, look after the children, prepare and cook the food, fetch the daily supply of water (often an arduous job), cultivate the plantation, and go to market. And the reason is that the African is an exceedingly hungry person. It is their custom to eat several times a day when at home, and the men spend most of their day sitting in the palaver house or market-place, while the women bring the food all day long. One wife could not possibly do this. Besides, the African lady encourages it, for she says, "The more wives, the less work." Amongst the Ahiaras, Onichas, Obuwus, and the lower class of pagan tribes in the interior, there is very little form of marriage. As soon as a man has the means, he pays the parents what they want, in the shape of goats, cows, beads, money, and takes the girl. There is no ceremony at all. The more wives he has indicates a richer man, and that he will be better looked after. If, of course, they can manage to seize a woman from the neighbouring tribe while she is fetching water or working on her farm, so much the cheaper. With this method in vogue for centuries, no wonder that it is as much as a native's life is worth to go out of his own village, and that the country is so backward. With the tribes of the Bende, Afikpo, Oguta, and Onicha districts, a girl is betrothed to a future husband when only a few years old, he giving her presents from time to time as

well as her parents. Infant marriage is apparently not in vogue at all. Before a girl reaches a marriageable age, she undergoes the fattening process, during which she is generally painted in some way, after which she is painted over with red camwood by her husband. The various tribes intermarry very little. Twins are regarded with terror from the Niger to the Cross river with very few exceptions. With these tribes in the interior, it was the custom to kill them and the mother too. With the river tribes it is the custom to drive the mother and infants out of the community; the Igaras up the Niger, to show that this custom varies, welcome twins as being lucky.

Religion does not absorb much of these peoples' time. True it is that every village has its Juju house, sometimes several, generally clean, well kept, and every compound has its deity, but if you ask these people what they are for or what they do, they will simply tell you, "Our forefathers had them, and so we must." The Jujus generally consist of several very ugly carved images of human beings, all highly painted with several colours, under a shelter of some sort in every market-place, the paths to which will generally be lined with rows of earthenware chatties, rotten with age, and filled with eggs, perhaps, or bones. These pagan natives all believe in a future life of some sort—that death is only the passing from one sphere of life to another, that other being, perhaps, a sacred tree, wild beast, their own children, or perhaps their spirit may wander about frightening any one who may come across it. In fact, their beliefs are very mysterious, but they are hard to find out, owing to the unreliability of one's interpreters. The country, as at present known, has no natural resources, with the exception of the Oka district, where a little copper and iron are worked. No doubt when the country is more peaceful, a mineral survey may bring to light some valuable discoveries. North of the Bende Owerri road, and about 20 miles inland from the Niger and Cross river, the palm oil trees begin to get very scarce; and when you take the palm oil tree away from West Africa, you get a very poor country indeed, especially when you have no rubber, ivory, or timber to make up for it, and an indolent population. But there is not much of this sort of country in the Protectorate, for away to the north again, where no white man has as yet penetrated, both the country and its population improve from all accounts. Let us be content, then, with the good work that is being done here in the cause of civilization.

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Before the paper, the PRESIDENT: I have to introduce to you Lieut. Steel of the Royal Artillery, who was seconded for military service in Nigeria, where he passed about four years. He is about to give us an account of his journeys in certain out-of-the-way parts of Southern Nigeria where travellers had never before been.

After the paper, the PRESIDENT: Before the discussion commences I wish to take you for one moment to two other parts of the world—to Norway, and to the Himalayas. We are honoured to-night by the presence of two distinguished young

Norwegians, Mr. Rubenson and Mr. Monrad Aas, of whom you have read in our *Journal* as having lately made a magnificent ascent of Kabru, and having thus reached an altitude greater than any living man had reached before. I cannot leave the subject of Norway without also congratulating ourselves upon the return amongst us here of His Excellency Dr. Nansen. To come back from the heights of the Himalayas to the low level of Southern Nigeria, I propose to call first upon Sir Ralph Moor, who you may remember was the Administrator of the Niger Coast Protectorate, and who, on January 1, 1900, became High Commissioner for the whole of Southern Nigeria. If I am not mistaken, he was still there when that expedition took place of which Mr. Steel has told us, which broke the power of the Arochukua. He directed that expedition as he had directed the earlier expedition against Benin.

SIR RALPH MOOR: I think I may first, as one of the audience, and on behalf of the audience, thank Lieut. Steel for a most interesting lecture, and for the very excellent pictures he has put on the canvas before us. It has been particularly interesting to me, because, as Sir George Goldie tells you, from the start of the Administration in 1891 until 1903, I was there, watching the progress and taking part in it. Lieut. Steel has told us that in that country your neighbour is always a bad man. Well, I think you may take it for granted that the white man is the worst man as far as the native is concerned, for when the native first makes your acquaintance he pretends to be your friend, and he does this because of his acquaintances in the interior, and uses you as a bogie to frighten those acquaintances.

The area shown on the map between the coast-line and the part Lieut. Steel has spoken of was dealt with during the thirteen years I was there. I suppose it represents something like 20,000 to 30,000 square miles, and when we went there first in 1891 the stations at the mouths of the river within sight of the sea were the only parts under the control of the white man at all, so much so that Calabar, the headquarters, was within 30 miles of a large slave market, which continued to be held until an expedition was undertaken against it. At Bonny, within a very short distance of the sea, there was a native tribe of cannibals, who were prosecuted with the aid of a gunboat in 1892 for eating a lady. They did not wait to kill her before cutting her up. All along that coast you could only go in 20 or 30 miles. Exploration was carried on gradually, and prismatic compass surveys made, but there was no really definite attempt to carry on survey work until 1895, when we had a Boundary Commission with the Germans, and then some real effort was made to make a scientific survey of the country. However, as the survey of the country was gradually carried on, first we had to take over the Benin country, or rather, were forced into doing so at the time when there was a massacre of seven or eight Europeans and 200 natives, which necessitated Government control being established over the country, and later the country joining, where Lieut. Steel was, was taken. The whole of that country was dominated by two jujus. The juju of Benin city extended from the Niger to the west, in former years as far as Lagos and up to the Niger. On the east side of the Niger river was the Aro juju, which extended down to the German colony and slightly to the west of the Niger in parts. The necessity for the expedition arose, and was brought to a head by an expedition of some 800 natives proceeding from the region of the Niger to appeal to the juju. They were at Aro Chuka for some two years, I fancy, when the Government was able to rescue about 135 of them, who were a miserable residue of the 800. When they came they were a most terrible sight to look upon; they were no use to sell as slaves and no use to put into the pot or they would not have been left, so they were allowed to escape. Of course that juju was an immense fraud. The natives appealed to it, and the slaves who were taken there were

always condemned to death. They were taken behind a screen into a cave similar to that described by Lieut. Steel, and then, instead of being killed, as the people who took them there supposed, they were sold into slavery; so the Aros made not only the fees which were charged for trial, but he made the profits out of the selling the men he was supposed to have killed. Lieut. Steel mentioned the juju fish, and it is reported, I gather from him, that they are now carried to a new place and regarded as the original ones. I remember distinctly, after the Aro expedition, in writing a report of it, stating at the end, that the sacred crocodiles had been killed, and that the sacred fish had been eaten without any ill effects, so that the fish that are at this new place that he has described are certainly not the original ones. And the drum again that he speaks of, I quite understand what that was. They had a similar thing at Aro Chuka in the form of large pots buried in the ground inside the juju cave, and the Aro priest who had to speak put his head down into the pot and mumbled out his words there, so the sound of the voice appeared to come from the ground. With regard to the superstitions of the natives, I remember a very interesting story of a Hausa elephant hunter. He had, of course, an old bundook gun, which was very long but would not have killed an elephant. The method adopted was the poisoned arrow. I asked the hunter, "How do you get that arrow to penetrate into your elephant?" He said, "I go quite near to him." And I said to him, "But aren't you rather afraid of going so near an elephant?" "Oh no," he said, "I am not afraid; I cover myself with my juju and the elephant cannot see me, he does not know I am there;" and the man had absolute faith that the elephant could not see him at all. When a man has that faith there is no bravery in his calling. This paper has been exceedingly interesting to me. The progress is a continuation of what I watched for some twelve years; it will have to go on for a good many years more, but it is a territory which is going to be of great value to this country, and the future of it is one that will be very valuable. I have again to thank Lieut. Steel for his very excellent lecture.

Mr. F. SHELFORD: The paper that we have heard to-night has been of great interest, and the work that Lieut. Steel has been doing is most useful. A large part of the colony of Southern Nigeria, particularly between the Cross river and the Benué, is still unknown. As far as I can gather, Mr. Steel has explored over 1500 square miles of this district. Of course, I quite understand that mapping is not the only work he has done. The country has been brought under control as well. I would like to say a word in support of the author with regard to the gin trade. I quite agree with him in what he has said. I have frequently been in Africa, and I never yet saw a West African the worse for liquor. When I came home from Africa last year, I did a motor ride on Whit Monday, and I am afraid I cannot say the same for my own countrymen.

It is, I think, fairly well known to the public that the railway from Lagos is proceeding rapidly towards Jebba on the Niger, and at the same time we have headquarters at Jebba and are constructing the railway northwards and southwards from this point. At the same time the High Commissioner of Northern Nigeria is striking a railway from Baro on the Niger towards Zaria and Kano. When this programme is completed the railway system will represent some 800 miles of line. The system really consists of a main line of railway from Lagos to Kano, with a branch line to Baro. It may be a question hereafter, when some goods are at Zungeru, whether it is better to convey them overland or down the Niger; that is a question which will settle itself hereafter. Of course the rate charged upon the Niger may be less than by the railway to Lagos, but the question is whether you can get large quantities of goods down the river expeditiously. My own experience of the Niger was to be stuck on a sandbank for sixteen hours. Almost the whole

of the country between the Benué and the Cross river remains unexplored. It measures, roughly, 150 miles from Oguta to the Benué, and 250 miles from the Niger over to the German boundary, that is an area of 35,000 square miles at least which remains unknown. The only way to develop these countries and open up what is really the darkest part of Africa, is to construct roads, tramways, or railways, and assist the native to get his produce out of the country, and enable him to obtain goods from home.

Mr. E. P. COTTON: I have listened with great pleasure to Lieut. Steel's paper this evening. He has pointed out with remarkable lucidity the difficulties and danger which must be encountered in preparing a pathway for trade and commerce in regions where ignorance and savagery has hitherto prevented the tribes from trading even with their next-door neighbours. What Lieut. Steel has told us happened in the eastern province in 1906 occurred in the western province less than twenty years ago, where at present a contented and prosperous community are prosecuting their various avocations without the slightest fear of molestation; and, inferentially, we may hope that in less than twenty years hence these people of the eastern province may be enjoying the benefits of a large and increasing commerce, and appreciating the blessings of an enlightened government. I had hoped that Lieut. Steel would have had time to say more about the geology of Southern Nigeria, which is structurally composed of gneisses, schists, and granite, on the top of which sediments have deposited. In the coastal districts of the western province large bituminous areas have been discovered, and although bitumen appears to have no commercial value, it nevertheless indicates the presence of petroleum, which I firmly believe will yet be found. We must not, however, expect to find it in the first bore, any more than in auriferous country we should expect to find gold in the first shaft, and much labour and capital may be necessary to locate a positive position by negative evidence. With regard to the Yoruba people and their language, I should like to mention that I discovered recently that they have a deaf and dumb language in which they can converse quite intelligently and with great rapidity. I am not, however, yet able to offer a full explanation of the methods employed.

Mr. PARKINSON: I should like to mention the great pleasure I have had to-night in revisiting some old scenes in Southern Nigeria under the guidance of Lieut. Steel, and in hearing his account of many new ones. Two or three points are, I think, especially noteworthy in this paper; and one of them is the establishing of another part of the line of demarcation between the bush country on the south and the more hilly, open country on the north. Lieut. Steel has added very materially to our knowledge of one of the two districts in Southern Nigeria, which were, I think, practically unknown when I was there. The first, the north-eastern corner of the Protectorate, is still but little known, although I understand from Captain Ruxton that in Northern Nigeria the country to the south of the Benué and east of Abinsi has now been mapped. The second is the country between the Niger and the Cross river described to-night. Lieut. Steel showed us an excellent photograph of a round hut. One is inclined to associate the round hut with the Bantu; and Sir Harry Johnston, if my memory serves me correctly, said many years ago, that the people of the upper Cross river were in part Bantu. I was very much struck in the market-places round Abakalliki with the Bantu-like features of many of the natives. Another point I would like to mention is the importance assumed by the river Imo. Of course we all knew the Imo was an important river, but I do not think we all realized its source was as far north as, or farther north than, the latitude of Afigpu. I would like to ask Lieut. Steel if he can give me any information as to the kind of rocks found. The only specimen I have from between the Niger and the

Cross river is part of a limestone nodule from a village somewhere to the east of Oka, which very closely resembles the cretaceous limestones from the district south of the Oban hills. The westerly extension of the cretaceous beds is a matter of great geological importance.

The PRESIDENT: I will now ask you to give a hearty vote of thanks to Lieut. Steel for his valuable lecture.

Lieut. STEEL: Mr. Parkinson asked what is the nature of this country up the Cross river. I am afraid I left it out of my lecture. But it was an extensive series of sandstones and igneous rocks.

## SOME SCIENTIFIC RESULTS OF THE ANTARCTIC EXPEDITIONS, 1901-1904.\*

By Prof. J. W. GREGORY, F.R.S.

THE collections and observations made by the Antarctic expeditions of 1901 to 1904 are so extensive that the complete results will apparently not be available for another two or three years; but already a sufficient amount has been published to throw much light on many of the problems which the expeditions went forth to solve, and to indicate the answers that may be expected from the complete evidence collected. A brief reference to the various memoirs already published may be of service; but in this notice it is proposed to confine attention to the two British, the German, and the Swedish expeditions, for the earlier voyage of the *Belgica* and the later French expedition under Charcot do not belong to exactly the same campaign. Each of the four national expeditions is publishing its scientific results in a series of large quarto works, which will form, when completed, an Antarctic library of about thirty volumes.

\* 'National Antarctic Expedition, 1901-1904.' Natural History. Vol. 1, Geology (Field-Geology, Petrography); vol. 2, Zoology (Vertebrata, Mollusca, Crustacea); vol. 3, Zoology and Botany (Invertebrata, Marine Algae, Musci). British Museum (Nat. Hist.), London, 1907. (Vol. 4 not yet issued.)

'Deutsche Südpolar Expedition, 1901-1903.' Edited by E. von Drygalski. Vol. 1, Technik, Geographie, pt. i., 1905; vol. 2, Kartographie, Geologie, pt. i., 1906; vol. 5, Erdmagnetismus, vol. 1, pt. i., 1907; vol. 6, Erdmagnetismus, vol. 2, pt. i., 1906; vol. 7, Bakteriologie, Hygiene, pt. i., 1906; vol. 8, Botanik, pt. i., 1906; vol. 9, Zoologie, pts. i.-v., 1905-1907.

'Scottish National Antarctic Expedition. Report on the Scientific Results of the S.Y. *Scotia* during the Years 1902, 1903, and 1904, under the Leadership of William S. Bruce.' Vol. 2, Physics, pts. i.-iii., 1907; vol. 5, Zoology, pts. i.-xii., 1905-1908.

'Wissenschaftliche Ergebnisse der Schwedischen Südpolar Expedition, 1901-1903 unter Leitung von Dr. Otto Nordenskjöld.' Vol. 1 (Narrative, Geography, Hygiene, etc.), pts. 3 and 4, 1905; vol. 3, Geology, pt. 1, 1905; vol. 4, Botany and Bacteriology, pts. 1-6, 1905-1907; vol. 5, Zoology, pts. 1-9, 1905-1906.

## GEOLOGICAL RESULTS.

The full official statements of the geological results are still very incomplete. The general conclusions have been announced in a series of preliminary reports and narratives that deal more particularly with the glacial problems. Only the English expedition has published its final geological report, which has been issued as the first of four volumes on the natural history results of the expedition, published by the British Museum. This volume, prepared under the supervision of Mr. L. Fletcher, consists of two reports, one containing the observations of Mr. H. T. Ferrar on the glacial and stratigraphical geology of the region visited, and the other consisting of a detailed memoir by Dr. G. T. Prior on the rock specimens collected. Mr. Ferrar's report shows that South Victoria Land and the off-lying islands include rocks belonging to four distinct groups. The mainland is built on a foundation of rocks, which have petrographically the characters of the Archean. These rocks are covered by a wide sheet of horizontal sandstones containing traces of plant remains, but no recognizable fossils. The sandstones are cut through by sills of dolerite, and along the coast there are volcanic mountains of geologically recent date. Mr. Ferrar's work is important, as it gives the first definite information about the structure of South Victoria Land. He also describes the glacial features of the country, and represents Ross's Great Ice Barrier as a piedmont-glacier formed by confluent sheets of land-ice. The glacial observations made by the expedition cannot, however, be satisfactorily considered until the meteorological data collected have been published. Dr. C. Rabot, in an interesting paper on the glacial observations of the four expeditions, has remarked the contradictory statements as to the glaciers of South Victoria Land (*La Géographie*, vol. 16, 1907, p. 388). Some of the ice forms, whose nature is doubtful, were also met by the German expedition; and from Prof. von Drygalski, a leading expert on glacial geology, a convincing statement may be expected.

The second memoir in the report of the British expedition is a valuable description by Dr. J. T. Prior of its rock collections. The most interesting are the volcanic rocks of the Ross islands, among which Dr. Prior has identified basalts, kenytes, phonolites, and trachytic phonolites. He points out that these rocks are allied chemically to those ejected by the Atlantic and not by the Pacific volcanoes. The rocks, however, are closely allied to those of the southern end of New Zealand. If, therefore, South Victoria Land is to be regarded as having an Atlantic type of coast structure, so also has the southern province of New Zealand. The structure of South Victoria Land resembles, however, the secondary type of Pacific coasts, though the evidence collected by the expedition is not sufficient to settle conclusively the geographical character of this coast.

The geological work of the German expedition in the *Gauss* also

gives most valuable information as to the structure of part of the mainland of Antarctica. The Kaiser Wilhelm Land, discovered by the expedition, is probably the most westerly known continuation of Wilkes' Land, for Prof. von Drygalski and his companions saw land to the north-east of their winter quarters, not far from the site assigned by Wilkes to Termination Land.

The German expedition was only able to land on one part of the coast, and there it discovered the Gaussberg, a basalt mountain 370 metres high. The Gaussberg is an Upper Cainozoic volcano, probably either late Pliocene or Pleistocene. It is built of leucite-basalt and tuffs, which rest on a platform of plutonic rocks, as is indicated by the occurrence of nodules of granite and gneiss enclosed in the lava. The general structure of the mountain and its glaciation are described by Prof. von Drygalski, its geology by Dr. Phillipi, and Dr. Reinisch has contributed a detailed petrographic account of the rocks. The glacial evidence is geographically important, as the erratics collected show the continental nature of the land to the south.

The geological results of the Scottish expedition will be stated in the third volume of its collected reports, some of which have been already published. Thus, Mr. E. T. Newton has described the Devonian brachiopods collected in the Falkland islands, and gives a series of further illustrations of the variations of *Spirifera antarctica*.

The general distribution of the deep-sea deposits has been described by Dr. Harvey Pirie, and their range illustrated by a map, which fills a large gap in the petrographic chart of the ocean-floor. The geology of Gough island is described by Dr. Pirie, and its rocks by Mr. R. Campbell, who determines them as trachytes and trachydolerites, one of which contains hypersthene. Mr. Campbell identifies the rocks as belonging to the same general series as those of the Azores, Teneriffe, and the other Atlantic volcanic islands.

The geological work of the Swedish expedition has been summarized in a preliminary report by Dr. Gunnar Andersson, of which a review has already appeared in the *Geographical Journal*. The only part of the final geological volume which I have seen is that by Wiman on the early Cainozoic vertebrates of Seymour island; it contains the description of some fossil whales' bones and six new genera of extinct penguins. This discovery is of the greatest geological and geographical interest. The author attributes these species to the Lower Cainozoic, and seems inclined to favour their Eocene age. There has been a tendency to assign the Cainozoic deposits of southern Australasia to an unduly early age, and this influence has perhaps affected the author's opinion as to the age of these fossil birds. We shall, accordingly, await with interest the description of the other fossils obtained by the expedition, to see what light they throw on the precise age of this very important group of fossil penguins.

## THE NATIONAL ANTARCTIC EXPEDITION.

*Biological Results.*

The second and third volumes of the report of the National Antarctic Expedition are devoted to the zoological and botanical results which have had the benefit of the careful, expert editorship of Mr. Jeffrey Bell.

In the second volume the three longest reports are those on the mammals and the birds by Dr. Wilson, and on *Cephalodiscus* by Dr. Ridewood. Of all the reports in these volumes Dr. Wilson's are, no doubt, of the widest popular interest, as they deal with the habits and general natural history of the seals and birds. They are illustrated, moreover, by a series of plates after Dr. Wilson's charming sketches and Lieut. Skelton's artistic photographs. The expedition did not collect any new species of either mammals or birds, but it made the first discovery of a colony of nesting Emperor penguins; it obtained sketches or photographs of an undescribed dolphin in the outer zone of the pack-ice, and of the unnamed whale which had been previously seen by Ross and McCormick. Dr. Wilson's reports include a most interesting sketch of the life of the penguins and of the Weddell seal, of which the expedition obtained thirty-nine skins or skulls, as well as two foetal specimens and twelve embryos, which are being investigated by Dr. Marrett Tims. Dr. Wilson's report also describes the rarer Ross seal, supplementing the account by Dr. Racovitza published in the reports of the *Belgica* expedition. It was found that the Emperor penguin breeds in mid-winter, and it was impossible then to reach its nesting-ground and thus collect the fresh eggs or early embryos. Dr. Wilson deplors this fact, as he suggests that the Emperor penguin may be "the nearest approach to a primitive form, not only of a penguin, but of a bird." This view, however, receives no support in the next memoir, which is a valuable description by Mr. W. P. Pycraft of various points in the anatomy of the penguins. Mr. Pycraft also gives a useful summary of previous literature on the subject. Mr. Pycraft's most interesting addition to knowledge of the penguins is probably his account of the development of the feathers, based on the study of specimens in the resting plumage. He shows that the old view that the feathers of the penguins are allied to the scales of snakes and thus indicate the primitive nature of the penguin, is without foundation. The feathers, he says, are "unquestionably degenerate," and he refers again later to the "intense specialization which these birds have undergone."

Dr. Ridewood's monograph on *Cephalodiscus*, one of the primitive members of the Chordata, includes the description of probably the most important of the new animals collected by the British expedition. The specimens were recognized as *Cephalodiscus* by Sir Ray Lankester, who

described one species, which is now made the type of a new subgenus, *Idiothecia*. Dr. Ridewood adds a new species, *C. hodgsoni*. His report is a complete monograph on this very interesting genus, once regarded as a member of the Bryozoa; it appears to be most abundant in the Antarctic seas and Southern ocean, though it has been found by the Siboga expedition, as described by Dr. Harmer, off Korea, Celebes, and Borneo. Dr. Ridewood's detailed research on the material collected by Mr. Hodgson has enabled him to determine the nature of some hitherto doubtful structures in the anatomy of these animals.

The fish collection is described by Mr. Boulenger, and includes ten species, of which four are new; five of the remaining six were previously collected in the same district by the Southern Cross Expedition.

The cephalopods, described by Mr. W. E. Hoyle, are represented by some mandibles found in the stomachs of the seals and the penguins. The rest of the Mollusca are described by Mr. E. A. Smith and Sir Charles Eliot. Mr. Smith describes the ordinary gastropods (twenty six species) and lamellibranchs (fourteen species), of which three-fourths are new; only one of the species had been collected by the *Belgica* on the other side of the Antarctic area, but the one species of Amphineura, a chiton, perhaps the most interesting of the Mollusca, had been previously described from specimens discovered by the German deep-sea expedition (*Valdivia*) off Bouvet island. Mr. E. A. Smith also describes the two brachiopods, both of which are new, though one is only separated doubtfully from a species found on the coasts of Patagonia and Kerguelen.

The pteropods are described by Sir Charles Eliot. Specimens of five species were collected, all belonging to previously known species; their interest lies in their distribution, and Sir Charles Eliot's remarks on their evidence are quoted subsequently. The small series of nudibranchs is divided among twelve species, ten of which are new, while two belong to new genera.

The reports on the Arthropoda are contained in the second and third volumes. Two species of decapods were obtained, and they are identified by Dr. Calman with species previously known from South Georgia. The collection of the Cumacea includes four species, two represented by single specimens. One of the species also lives off Norway, in the Mediterranean, and West Ireland; but Dr. Calman remarks that he attaches very little value to that fact, as the animal has probably a continuous distribution between those areas.

The largest collection of Arthropoda is naturally that of Amphipoda, which are described by Mr. A. O. Walker. It includes fifty-three species, of which eighteen are new. Some of the species have a wide range, as they occur also in British, Arctic, and tropical seas. The amphipods include two anomalous and rare forms, and Mr. Walker

remarks the fact that the four species of *Iphimediæ* are much larger than the Arctic species of that genus.

Dr. Joseph Thiele describes the Leptostraca, one species of *Nebalia* that was found in MacMurdo bay by Mr. Hodgson. It was previously known from the Straits of Magellan, and was also collected by the German Antarctic Expedition at its winter quarters.

Prof. G. S. Brady describes the Ostroooda, of which nine species were found, including seven new ones, and Prof. Gruvel the four species of Cirripedia, two of which are new. Dr. E. L. Trouessart describes the two specimens of Acari, both found in Granite harbour; they belong to an Antarctic variety of an Arctic species, *Leptopathis alberti*, named after the Prince of Monaco.

The longest report in the third volume is that by Mr. Hodgson on the Pycnogonida, of which the expedition obtained what, for this group, was the remarkably large collection of twenty-eight species, including three new genera. Mr. Hodgson was delighted at his discovery of a new species, *Pentanyphon antarcticum*, which has ten legs instead of eight, the usual number in this group; he thus re-established the accuracy of Eight's description, seventy years ago, of a ten-legged pycnogonid from the South Shetlands.

The worms described in these volumes include three species of tapeworms, of which two are new; they were all found in the stomach of Ross's seal, and are described by Mr. A. E. Shipley. Dr. von Linstow describes the one nematod, a new species, interesting as the largest known free-living member of its order. Dr. G. H. Fowler describes the collection of that small pelagic worm, *Sagitta* (Chaetognatha), of which the expedition obtained three species; and he takes the opportunity of revising the Antarctic and sub-Antarctic *Sagittæ* collected by the *Challenger*. The three species obtained by the *Discovery* were previously known, but they have extended the range of this cosmopolitan worm southward as far as the winter quarters of the expedition.

Two reports have been issued on the Coelenterata; the first, by Prof. Hickson, describes the Aloyonaria, which are divided into eight species, of which three are new. The collection, Prof. Hickson remarks, has "not perhaps many very remarkable features," though one species helps to connect the genera *Primnoella* and *Oaligorgia*.

The hydroids, however, are described in the joint report by Prof. Hickson and Mr. Gravelly as "remarkably rich and interesting." The collection was nearly all obtained from the winter quarters, and represents a practically sub-glacial fauna. It included twenty-five species, of which eleven are new. The hydroid found at the greatest depth, 130 fathoms, and named *Tubularia hodgsoni*, is described as a "remarkably interesting species." The Coelenterata are also represented by a puzzling structure, which Mr. Hodgson nicknamed the "boot-lace," and was recognized by Prof. Bell as a tentacle of some

hydrozoon. A note by Dr. John Rennie, who had previously met with similar specimens in the collection of the Scottish Antarctic Expedition, gives a technical description, and shows that they are fragments of the tentacles of one of the Siphonophora. Fortunately, the Scottish expedition obtained sufficient of this animal to enable Dr. Rennie to show (*Proc. R. Phys. Soc. Edin.*, vol. 16, part 1, pp. 25-27, plate xvi.) that it probably belongs to the genus *Apolemia*, previously known in the Mediterranean.

The sponges are being monographed by Mr. Kirkpatrick, and appear to be one of the most important parts of the collections. There are no horny sponges, but rich series of both siliceous and calcareous sponges. The only group so far described is that of the Hexactinellida, which is represented by ten species, of which eight are new. They include the types of three new genera. This is a valuable addition to the Antarctic siliceous sponges, of which only one was known until the expeditions of the *Belgica* added nine species.

The botanical results of the National Antarctic Expedition are stated in two reports on marine algæ and one on mosses. The mosses are described by M. Cardot, whose report includes a list of fifty-one species known from the Antarctic regions. The expedition collected seven species, of which two are new, and as these mosses were found on Granite harbour and the islands around McMurdo sound, they are interesting as the most southern known land plants. M. Fosløe describes a new species of calcareous algæ, an incrusting lithothamnion, found at Coulman island. The other marine algæ are described in an interesting report by Mr. and Mrs. Gepp. The number of species (twelve) is small, but some are interesting novelties, and the report upon them contains some suggestive remarks as to the abnormal conditions under which these plants have grown, and states problems for investigation by future Antarctic biologists. Mr. and Mrs. Gepp's report includes a further addition to the new algæ they had previously described from the South Orkneys, brought back by the Scottish Antarctic Expedition.

Many of the contributors to the two volumes remark on the smallness of the collections. The general regret that it was not possible to afford greater opportunities for the use of the equipment at sea is increased by the ample fresh evidence afforded by the expedition of the extreme richness of the Antarctic fauna. How varied it is may be illustrated by the nudibranchs, of which sixteen specimens were collected by the expedition. Sir Charles Eliot assigns five of these to one species, and each of the remaining eleven specimens represents a distinct species, of which nine are new. Mr. Hodgson, in his very interesting introduction to the third volume, remarks that in McMurdo sound "the fauna was extremely rich," and therefore naturally deplores the few opportunities he had of collecting, except at that one locality.

The general regret expressed in these volumes at the smallness of the collections is joined with warm appreciation of the resourceful ingenuity and untiring energy with which Mr. Hodgson used every available opportunity. Thus Professor Hickson and Mr. Gravely express their admiration and appreciation of his services to science, describing them as proof of "extraordinary skill and enthusiasm in the cause of zoology."

#### THE GERMAN EXPEDITION.

##### *General Reports.*

The scientific results of the German expedition have the advantage of issue in one complete work of ten volumes, instead of being scattered amongst various publications. Ten parts have been received up to date, but as several of these are preliminary descriptions of the methods of equipment, it is not yet possible to estimate the full results. The work has been prepared with characteristic German thoroughness. The first part is devoted to a detailed account of the *Gauss* and its technical and scientific equipment, by the chief engineer, A. Stehr. His report is illustrated with a series of thirteen valuable plates. Two volumes (5 and 6) are assigned to terrestrial magnetism, and one part of each has been published, but they both deal with the apparatus and methods employed, and not with results. Dr. Bidlinmaier begins the fifth volume with a memoir on the double compass, and traces its development from its suggestion by Captain Walker. He maintains that the results given by the instrument during the expedition show its suitability for such work. Herr K. Luyken, in the first part of the sixth volume, describes the magnetic observatory established on Kerguelen.

One part has been issued of the volume (No. 8), on bacteriology and hygiene, and consists of a report by Dr. Gazert, the medical officer of the expedition, on the food used, and on the methods by which it was tested, packed, and stored. He gives a full list of the provisions used, with notes as to their success and popularity. The daily rations of each are stated in grammes. He discusses the value of alcohol, with the conclusion that its use should be avoided during journeys, but that a little in winter quarters or on board ship is harmless.

##### *Biological Results.*

Turning to the biological work of the expedition, sufficient has been published to show the high importance of its collections, which appear to be so large that there has not yet been time to work out any of the larger zoological groups or marine algæ.

The botanical results are given in the eighth volume, of which six

parts have been issued. They deal with the land plants, and nothing has yet been published dealing with the marine flora. The collections of land plants were made mainly on the sub-Antarctic islands, and the most interesting material, in reference to Antarctic problems, is from Kerguelen and from Possession island, one of the Crozet group.

The fungi are described by Prof. P. Hennings. His report raises the list of species known from Kerguelen and Possession island from eleven to forty-three, of which thirty-seven are new.

The liver mosses are described by Prof. Victor Schiffner, and are mainly from Kerguelen, from which he records thirty-seven species, of which three are new. This flora includes sixteen endemic species; of the remainder, two are cosmopolitan, and the rest show that the liver mosses are more closely allied to those of the Magellanic region, with which it has fourteen species in common, than to those of Australia or New Zealand, with which it has only six species in common.

The lichens have been investigated by Dr. Alex Zahlbruckner, and in addition to a large flora containing many new species from Kerguelen, he records three species, of which two are new, from the Crozet group, and two from Heard island. The most interesting discovery is, however, that of three species from the Antarctic mainland at the Gauseberg, the winter quarters of the expedition on Kaiser Wilhelm II. Land in western Wilkes Land; they are the first known lichens from the mainland of Antarctica.

The mosses are described by Dr. V. F. Brotherus, who deals with a flora of sixty-one species, of which thirteen are new. Most of them were collected at Kerguelen, the Crozet islands, or Heard island; but some, including a new species (*Bryum filicaule*), were found on the mainland of Antarctica, at the Gauseberg.

The vascular plants collected on the sub-Antarctic islands are described by Prof. H. Schenk. The collection includes no new species; but the material obtained on the Crozet island is of interest, as proving that that archipelago is occupied by the Kerguelen flora. The last of the botanical reports yet published is that by Dr. Emil Werth on the vegetation of the sub-Antarctic islands. It is illustrated by eleven fine plates and numerous photographs; it describes the general character and aspect of the vegetation, and discusses the problems of its special growth and environment.

The zoological results of the expedition are to be given in the ninth and tenth volumes, of which I have only seen four parts. They are enough to show the great value of the collections, though naturally the reports first ready deal with the smaller groups, so that the general bearing of the results on biological geography cannot yet be considered. The first memoir is by Dr. W. Michaelsen, of Hamburg,

on the Oligochaeta, of which the expedition obtained seven new species. The section of this report of most general interest is the author's discussion of the bearings of the collection on the former history of Antarctica, and its past relations to the sub-Antarctic regions. Several new species of Notodrilus, a worm with a very interesting distribution, were discovered on the Crozet islands, and Dr. Michaelsen has been induced by this new evidence to change his views as to the former geographical conditions of the sub-Antarctic lands. He had hitherto regarded the hypothesis, that the distribution of the worms showed that the sub-Antarctic lands were once much larger, and their southern points connected to an Antarctic continent, as unnecessary. After an interesting discussion on this subject, and of Prof. Benham's well-known address, he concludes that, though the distribution of the Oligochaeta may not absolutely require the once greater size of the Antarctic continent, it is very difficult otherwise to explain the facts (p. 55).

The Leptostraca are described by Herr J. Thiele. The collection consisted of fifteen specimens of a new species and a *Nebalia longicornis*, *magellanica*, both of which were found at the winter quarters of the expedition near the Gaussberg.

The marine Acari are described by H. Lohmann, of Kiel. The collection is very rich, and the report on it is illustrated by sixteen plates. The expedition obtained no less than six hundred specimens off the coast of Wilkes Land, and they are distributed amongst twenty-nine species, of which twenty-two are new. The report describes one new genus (*Werthella*), and gives a chart of the world showing the distribution of the species. The author concludes (p. 365) that two striking results of his study of the affinities of the Antarctic Halacarids are that they are nearly allied to those of warm seas, and have an intimate relationship to those of the greater oceanic depths in the northern hemisphere.

Among the additions to the fauna of the sub-Antarctic islands is the report by G. Budde-Lund, of Copenhagen, on the land isopods, based on a collection of thirteen species, of which three are new. One of the new species was found during the visit of the expedition to Simon's Town.

The Pteropoda obtained by the *Gauss* are described by J. Meisenheimer, of Marburg, who has obviously had to handle an enormous collection. It has yielded two new species and several new varieties. Pteropods were collected at seventy-four stations, and the total number of specimens obtained must have been very large. At one station, for example, twenty-one species were represented by 119 specimens, in addition to three species, of which the numbers are recorded as "numerous" or "very numerous." Much of the material was obtained in the Atlantic and off the Cape during the voyage, but a fine series

was obtained off the coast of western Wilkes Land, near the winter quarters. The distribution of the pteropods is illustrated on a chart of the world. The author of this report discusses bipolarity in reference to three species that are common to both polar seas, and he reaffirms his previous conviction that the pteropods developed first in tropical seas, whence they spread to the poles. The disappearance from the tropics of species that still live in the colder northern and southern waters has given them their present discontinuous distribution.

Another pelagic group well represented in the *Gauss* collections is that of the salps, described by Dr. C. Apstein, of Kiel. He has taken the opportunity of issuing a complete monograph of the genus, including a systematic synopsis of all the species and their distribution. Two species were collected off the Gaussberg.

A microscopic fauna has been isolated from the mosses of the Gaussberg and of some of the southern islands, and described by Prof. F. Richters. The fauna with which he deals comes from seven localities; the most southern was the Gaussberg, from which he records two protozoa (an *Amoeba* and a *Corycia*), four rotifers, and a tardigrade. Prof. Richters, in his interesting summary of the conditions under which this southern moss fauna lived, expresses his surprise that, in spite of his careful examination of the sods of *Bryum* from the Gaussberg, so small a protozoan fauna was obtained. He thinks the paucity of the results cannot be explained as due to failure in observation. From the sub-Antarctic islands the microscopic fauna was naturally much larger, and includes many new species. From the Crozet islands Prof. Richters records eighteen Acari, including eleven new species and three new genera; and in mosses from the same locality he obtained five species of insects, including a new genus, and six species of water-bears, some of which are known from Arctic regions. Ten species of water-bears were also found in Kerguelen. These animals are so ubiquitous that their distribution is of little significance.

The sponges appear to be among the commonest animals found on the Antarctic shores, but so far, of the German collections, only the *Tetrazonia* have been described. The memoir on this group of sponges is by Dr. R. von Lendenfeldt, who has divided the 267 specimens collected at the winter quarters of the expedition amongst six species; one new species belongs to a genus *Tribrachion*, previously only known from the West Indies, and two of the species (*Plakina irelopha* and *P. monolopha*) live also in the Mediterranean. The memoir includes a long detailed description of the species, and Dr. von Lendenfeldt remarks that they present no unusual structural features.

The Protozoan collection, on the other hand, has yielded some remarkably interesting new forms, most of which have been described by Dr. O. Schröder, of Heidelberg. In one memoir he describes four

species of Infusoria; in another a new rhizopod, representing a new genus of Foraminifera, *Echinogromia*, dredged from the depth of 380 metres. A third memoir, by Dr. Schröder, describes a new genus of Radiolaria, *Cytocladus*, referred to a new family, the Cytocladidae. The animal is of interest from its comparatively colossal size of 14 mm. in diameter. As there is no available evidence about the life-history of the animal, the author is doubtful whether a new group should not be established for it, intermediate between the Radiolaria and the Heliozoa. Another unusually interesting new discovery is that of a stalked Radiolarian, from the northern coast of Wilkes Land; the author names it *Podactinellus*, and it is illustrated by two coloured plates. This interesting genus is also the subject of a memoir by the doyen of German protozoologists, Prof. O. Butschli, who proves that the spines of *Podactinellus* consist of strontium sulphate. This somewhat startling fact is demonstrated by the use of those refined methods of microscopic chemistry of which Butschli is such an acknowledged master. The author remarks that he has no knowledge of strontium having been previously found in animal skeletons, and refers to detailed analyses that he had previously made of the calcareous skeletons of many marine organisms, by which the absence from them of strontium had been clearly shown.

#### THE SCOTTISH EXPEDITION.

The scientific results obtained by the Scottish expedition under Dr. Bruce in the *Scotia* have been partly issued in a series of papers, which already number fifty-six, scattered through various scientific serials, including the *Philosophical Transactions*, the *Transactions and Proceedings of the Royal Society of Edinburgh*, the *Proceedings of the Royal Physical Society of Edinburgh*, the *Scottish Geographical Magazine*, and the *Ibis*. The following list, which omits numerous preliminary and general papers on the expedition, and those that are being reprinted as vol. 5 of the expedition reports, may therefore be useful:—

- 'Report of the Scientific Results of the Voyage of the S.Y. *Scotia* during the Year 1902, 1903, and 1904.' Vol. 2, Physics. 1908. Pt. i. R. O. Mossman, Meteorology; pt. ii. Charles Chree and R. C. Mossman, Magnetism; pt. iii. G. H. Darwin, Tides.
- J. H. Harvey Pirie and R. Campbell, "Notes on the Geology and Petrology of Gough Island." *Proc. R. Phys. Soc. Edinb.*, vol. 18, No. 6, 1906, pp. 258-266.
- J. H. Harvey Pirie, "On the Graptolite-bearing Rocks of the South Orkneys." *Proc. R. Soc. Edinb.*, vol. 25, pt. 6, 1905, pp. 463-470.
- E. T. Newton, "Some Falkland Island Fossils." *Proc. R. Phys. Soc. Edinb.*, vol. 18, pt. 6, 1906, pp. 248-257, pl. x.
- W. E. Clarke, "On the Birds of Gough Island, South Atlantic Ocean." *Ibis*, vol. 5, 1906, pp. 247-268, pl. vi.

- W. E. Clarke, "Ornithological Results of the Scottish National Antarctic Expedition. On the Birds of the South Orkney Islands." *Ibis*, vol. 6, 1906, pp. 145-187, pl. iii.-xiii.
- W. E. Clarke, "On the Birds of the Weddell and Adjacent Seas, Antarctic Ocean." *Ibis*, vol. 7, 1907, pp. 325-349, pl. vii.
- L. Dollo, "Bathydraco scotiae, Poisson abyssal nouveau recueilli par l'Expédition Antarctique Nationale Ecossaïse." *Proc. R. Soc. Edinb.*, vol. 28, 1906, pp. 65-75.
- L. Dollo, "Neobythites brucei. Poisson abyssal nouveau recueilli par l'Expédition Antarctique Nationale Ecossaïse." *Proc. R. Soc. Edinb.*, vol. 28, 1906, pp. 172-181.
- L. Dollo, "Notolepis coatsi. Poisson pelagique nouveau recueilli par l'Expédition Antarctique Nationale Ecossaïse." *Proc. R. Soc. Edinb.*, vol. 28, 1907, pp. 58-64.
- L. Dollo, "Prymnothonus hookeri, Poisson pelagique de l'Erebus et de la Terror retrouvé par l'Expédition Antarctique Nationale Ecossaïse." *Proc. R. Soc. Edinb.*, vol. 27, 1907, pp. 35-45.
- T. V. Hodgson, "On Decalopoda australis, Eight: an old Pycnogonid rediscovered." *Proc. R. Phys. Soc. Edinb.*, vol. 18, pt. 1, 1905, pp. 35-42, pl. iii., iv.
- Prof. J. A. Thomson, "Note on the Gonostyles of two Antarctic Siphonophora." *Proc. R. Phys. Soc. Edinb.*, vol. 18, 1904, pp. 19-22, pl. i.
- John Rennie, "On the Tentacles of an Antarctic Siphonophora." *Proc. R. Phys. Soc. Edinb.*, vol. 18, 1905, pp. 25-27, pl. ii.
- J. A. Thomson and J. D. Fiddes, "Note on a Rare Sponge from the Scotia Collections." *Proc. R. Phys. Soc. Edinb.*, vol. 18, pt. 6, 1906, pp. 231-232.
- James Murray, "Note on Microscopic Life in Gough Island." *Proc. R. Soc. Edinb.*, vol. 27, No. 4, 1908, pp. 127-129.
- A. and E. S. Gepp, "Scotia Collections: Algæ." 1, Antarctic Algæ. *Journ. Bot.*, vol. 43, 1905, pp. 105-109, pl. 470.
- "Atlantic Algæ of the Scotia." *Ibid.*, pp. 109-110.
- "More Antarctic Algæ." *Ibid.*, pp. 193-196, pl. 472.
- E. N. Holmes, "Some South Orkney Algæ." *Journ. Bot.*, vol. 43, 1905, pp. 196-198.
- A. and E. S. Gepp, "A New Species of *Lessonia*." *Journ. Bot.*, vol. 44, 1906, pp. 425-426.
- R. N. Rudmose Brown, "The Botany of Gough Island." I. Phanerogams and Ferns. *Journ. Linn. Soc., Botany*, vol. 37, 1905, pp. 238-250, pl. 7-9.
- R. N. Rudmose Brown, O. H. Wright, and O. V. Darbishire, "The Botany of Gough Island." II. Cryptogams, excluding Ferns and Unicellular Algæ. *Journ. Linn. Soc., Botany*, vol. 37, 1905, pp. 263-267.
- R. N. Rudmose Brown, O. H. Wright, and O. V. Darbishire, "The Botany of the South Orkneys." *Trans. and Proc. Bot. Soc. Edinb.*, vol. 23, 1905, pp. 101-110, pl. iii.

These papers are being reprinted, with much new material, in a work entitled "Scottish National Antarctic Expedition: Report on the Scientific Results of the Voyage of S.Y. *Scotia*," which will apparently consist of from six to eight quarto volumes. Vol. 2 has been subdivided into two volumes, of which the first has been issued. Others are promised in quick succession.

The first volume will contain the narrative and log; the second is devoted to meteorology and physics; the third, to botany, geology, and cartography; and the zoological results will occupy the remaining volumes.

The only volume yet complete is that issued as the first part of vol. 2, and deals with the meteorology, magnetism, and tides. It is mostly occupied by the meteorological results. The meteorological staff of the expedition was exceptionally experienced. Mr. R. C. Mossman, the chief meteorologist, had been for fourteen years in charge of the principal meteorological station in Edinburgh, and had acted as interim superintendent of the Ben Nevis Observatory. He is already well known from his memoirs on Scottish meteorology, and he was assisted by two other trained meteorologists, Mr. Bruce and Mr. Wilton. The record of the meteorological observations occupy 306 pages, and are illustrated by eleven plates and maps. The meteorological observations are printed at length, and their general bearings are discussed in a series of interesting summaries by Mr. Mossman, who suggests the probable position of the coast of Antarctica, in districts where it has not yet been reached, from the position of the cyclonic centres. He concludes there must be land to the west of Graham Land, as the area near it, south of  $64^{\circ}$ , is apparently under the influence of the South Polar anticyclone. The power of the cyclones that cross the South Orkneys may be illustrated by Mr. Mossman's statement that, owing to their influence, the nights in the winter were often warmer than the days.

The rest of this volume is occupied by two short reports, giving the result of the magnetic and tidal observations. Both of these have been already published in the *Philosophical Transactions*, and are to be issued in the volume dealing with the physical work of the *Discovery*. The report of the magnetic observations is by Dr. Chree, while Sir George Darwin discusses the tidal observations. The value of the tidal constants have been worked out by Messrs. Selby and Hunter of the National Physical Laboratory, who remark that the observations appear to have been taken with great care. Sir George Darwin explains that the tidal results are quite normal, and that the diurnal tides are almost exactly in the phase indicated by the equilibrium theory. He remarks that the results are very valuable as relating to the only ocean uninterrupted by land throughout the whole circumference of the globe; and their normal character is an interesting contrast to those observed by the *Discovery* in McMurdo sound, which, according to Sir George Darwin, are very abnormal.

#### *Biological Results.*

The zoological reports will be collected in three volumes, of which vol. 4 will deal with the vertebrates and tunicates.

The reports on the birds have been prepared by Mr. Eagle Clarke, of the Royal Scottish Museum, and already published in the *Ibis*. He describes some of the results as of first-rate ornithological importance. The collections include two new species of buntings, discovered on Gough island. The second report describes the birds of the South Orkneys, and is illustrated by eleven plates, including coloured drawings of the young of various species, and photographs of penguins when courting, nesting, and feeding their young. Mr. Eagle Clarke has incorporated in this report the careful observations made by members of the expedition, including records of the temperatures of the birds. In addition to its new species of birds, the expedition was fortunate in the first discovery of the eggs and nesting-places of the Cape petrel or Cape pigeon, one of the most familiar birds of the southern seas. The birds of the Weddell sea and of Coats Land, from the collections and observations made during cruises in 1903-1904, are described in Mr. Eagle Clarke's third report (*Ibis*, April, 1905). Seventy-four specimens were collected in the Weddell sea, and they added four birds to the nine which, according to Howard Saunders, alone were previously known from south of the Antarctic circle. The collections add greatly to the range of various species; the "Cape pigeon," for example, was found as far south as  $71^{\circ} 50'$ , and petrels were seen far to the south of their breeding-places. One very remarkable instance of bird distribution was the discovery of the Arctic tern as far south as  $74^{\circ} 1' S$ . No tern was found on the shore at the winter quarters of the expedition, and the South American tern was apparently confined to much lower latitudes; but the Arctic tern, during the northern winter, visits the Antarctic regions, and thus has the greatest recorded range in latitude of any known bird ( $82^{\circ} N$ . to  $74^{\circ} S$ ).

The fishes are to be described by Dr. Dollo, who has already issued a description of a few special forms, including the abyssal fish *Neobythis*, the affinities of which have given rise to considerable difference of opinion, and are carefully discussed by Dr. Dollo.

The fifth volume consists of the first series of memoirs on the invertebrates, and is complete except for the report on the Medusæ. Most of the volume has already appeared in the *Transactions* of the Royal Society of Edinburgh.

The mollusca are described by Messrs. Melville and Standen, who record ninety-four Antarctic species of gastropods, scaphopods, and lamellibranchs, of which twenty-one are new. One interesting dredge haul yielded about twenty specimens of *Guillella alabastrina*, hitherto known only by the one specimen collected by the *Challenger* in nearly the same locality. Sir Charles Eliot describes the nudibranchs. The fauna consists of six species, of which four are new, and they include two new genera, that Sir Charles Eliot describes as "very interesting." One of them—*Notacolida*—is the type of a new family.

The reports in this volume on the arthropods includes that by Mr. Hodgson on the Pycnogonida. He describes the collection as "a large one and extremely interesting, totally different from that made by the *Discovery* in the same region, but on the opposite side of the world. If smaller in the number of species brought home, in number of individuals it far exceeds that collection." The most important contribution made by the *Scotia* to the knowledge of the pycnogonids was the rediscovery of *Decalopoda australis*, which had been described by Eights about 1836, and has hitherto, Mr. Hodgson says, "been either forgotten or despised as a monstrosity or as a sample of defective work." Hodgson has previously discussed this form in a paper published by the Royal Physical Society of Edinburgh, in which he maintains the validity of Eights' name and the accuracy of his description. The *Scotia* also obtained a specimen of the *Pentanymphe antarcticum*, the second ten-legged pycnogonid, which Mr. Hodgson discovered in the Ross sea, and he records as found also by the French and German expeditions. In discussing the distribution of the pycnogonids, Mr. Hodgson suggests the division of the Antarctic and sub-Antarctic regions into three provinces—the Magellanic, Australasian, and Kerguelen—and that number certainly seems more natural for Antarctica than a subdivision into quadrants.

Two interesting reports on the land arthropods are contributed by Prof. G. H. Carpenter and Mr. James Murray, dealing respectively with the Collembola and Tardigrada. Prof. Carpenter's report includes descriptions of two new species and one new variety of an old species, and an interesting discussion of the geographical affinities of the fauna. He argues that the distribution of these wingless land insects indicates that Antarctica must once have been much larger, and formerly connected with other lands. He says (p. 57), "There can be no doubt that the trend of modern speculation is against the doctrine of the permanence through past ages of the great ocean basins of the present day." He seems disposed to agree with Ortmann that the last connection with Antarctica existed in the Cretaceous or the Eocene, and that the Collembola found in the South Orkneys and Dancoiland, with the presence of *Isotoma* on Kerguelen, indicate the former existence of a great land to the south of South America and connected to Kerguelen either by Antarctica or South Africa. He explains the present distribution of *Cryptopygus* and *Isotoma octo-oculata* as due to their survival throughout the Cainozoic. Another *Isotoma* (*I. brucei*) is of interest, as, though a new species, it is very nearly allied to the Arctic species *I. beselsi*, which has also been recently found in Tierra del Fuego. Prof. Carpenter holds that this species must have migrated from the one polar region to the other through America.

The water-bears are described by Mr. James Murray, and were found in the mosses from the South Orkneys; they include fifteen

species, of which three are new. Mr. James Murray has also added to the sub-Antarctic fauna of Gough island, by the description of the microscopic life found in the mosses of Gough island, in a paper, *Proc. R. Phys. Soc. Edin.*, vol. 17, No. 4, 1908. He discovered in washings from the mosses an egg and two recognizable species of rotifers, which are widely distributed. He also found three species of rhizopods and two of worms.

The parasitic worms are described in this volume; they include a new species of *Echinorhynchus*, founded on sixty specimens obtained from the Weddell seal. The same seal has yielded two new nematods described by Dr. von Linstow. Of the free-living worms, Dr. J. F. Gemmill and Dr. R. T. Leiper describe two new species of Turbellaria from the South Orkneys.

The Coelenterata are dealt with in three reports. The first is on the Alcyonaria, by Prof. J. A. Thomson and Mr. James Ritchie, who describe nine species, of which six are new. One of the previously known species, *Umbellula durissima*, was represented in the collection by twenty specimens, though it was previously only known from a young one collected by the *Challenger* in the North Pacific. The Hydroidea are naturally more abundant than the Alcyonaria; they include twenty-seven species, of which seven are new. One new genus, *Brucella*, is described by Mr. J. Ritchie as belonging to a rare and interesting type. The third report on the Coelenterata is that on the Antipatharia by Prof. J. A. Thomson; three species were found, all belonging to the genus *Bathypathes* and including one new species.

The fifth volume also includes Prof. R. Koehler's important memoir (116 pages, 16 plates), on the valuable collection of Antarctic echinoderms made by the *Scotia*. The fauna well shows the remarkable richness of the Antarctic seas. It includes thirty-five species of starfish, of which twenty are abyssal, and of these seventeen are new species, and there are two new genera, *Marcellaster* and *Scotiaster*. Thirteen of the abyssal Antarctic species were dredged between 62° and 71° S. The littoral starfish number fifteen species, of which three are new. Of the ophiuroids there are thirty-one species, of which sixteen are new, and twelve were found south of 62° and five south of 71°. The shallow-water members of this group are represented by twelve species, of which three are new. The sea-urchins (*Echinoidea*) are scarcer. The collection consists of twelve species; four are abyssal and Antarctic, and of these two species and one genus (*Delopatagus*) are new. There are also six littoral species, of which one is new.

The botanical results of the expedition include several preliminary descriptions of the vegetation of the sub-Antarctic islands. The systematic memoirs hitherto issued include only the three papers by Mr. and Mrs. Gepp, of which the first, dealing with the Antarctic algae collected by the *Scotia* (*Journ. Bot.*, vol. 43, 1905, pp. 105-109, pl. 470),

describes twelve species, of which five are new and one is a new genus, *Leptosarca*. Two of the species were also collected by the *Discovery* in the Ross sea, and of the others, one species was found also in South Georgia and the others in the Falklands and Cape Horn.

#### THE SWEDISH EXPEDITION.

The reports of the Swedish Antarctic Expedition are to be issued in seven volumes. The advertised price of the series is £15. The first column will deal with the narrative of the journey, the geography, cartography, hydrography, terrestrial magnetism, and hygiene; the second volume with the meteorology: the third with the geology and palæontology; the fourth with botany and bacteriology; and the last three with zoology. The reports are mainly in German.

Two parts (Nos. 3 and 4) of the first volume have been received, and consist of a report on the hygiene of the expedition by the medical officer, Dr. Ekelöf, and on diseases due to preserved food ("Ueber Präserven-Krankheiten"). In his first report he gives a full account of the health of the staff of the expedition, their weight curves, and of the food used. He discusses the question of scurvy, and in his two reports supports Nansen's view that it is due to the use of preserved meats. Dr. Ekelöf holds that all polar expeditions which have not used preserved meats have been free from scurvy. His explanation is that, though the treatment of preserved meats prevents normal fermentation, it cannot stop an analogous process of slow chemical decomposition, which is accelerated when the meat is stored in a warm place. The process gives rise to products similar to those due to fermentation. He thinks this autolytic change in preserved meats is not indicated by any properties that can be recognized by the senses. Hence its great danger. The author's practical suggestions are that in polar work all preserved meats should be prepared immediately before the start of the expedition, in order to limit as far as possible the development of these poisons. Further, that the preserved meats should only be taken as reserve foods, and that during the summer any party that has to winter in polar regions should collect adequate stores of fresh meat for use in the winter. This meat should not be salted, but should be hung up in a dry, cold, shady place or buried in snow. Dr. Ekelöf supports his conclusion by reference to the evidence that beri-beri is also a disease due to poison developed in foods by autolytic processes.

Of the zoological results, nine parts have been issued of vol. 5. It begins with a description by Dr. K. A. Andersson, the zoologist of the expedition, of the marsupial protection of the young in the "Feather-star," *Antedon hirsuta*; this method is adopted by occasional echinoderms, but is of no special Antarctic interest.

The second memoir includes Dr. K. A. Andersson's account of the

mammals and birds, and it is illustrated by a series of excellent photographic pictures of the life and habits of the seals and penguins, and by two maps showing the distribution of the breeding-places of the birds.

A list of the birds collected by the expedition is given in a systematic catalogue by Lönnberg (Part V.); and the same author contributes to this volume a valuable memoir on the fish obtained by the expedition. The richness of this collection is especially remarkable considering that a large part of it was lost with the *Antarctica*. The author objects to Dr. Dollo's limitation of the Antarctic fauna to the region within the Antarctic circle. Lönnberg maintains that any southern sea, where, as in Bransfield strait, the temperature in the summer, even to the depth of 1450 metres, is all below 0° C., deserves to be termed Antarctic. As such are the temperature conditions of Bransfield strait, which Dr. Gunnar Andersson describes as "the coldest marine area on the globe," the author seems certainly justified in including that district zoologically in the Antarctic.

The fish collection made by the expedition is divided geographically by Dr. Lönnberg into four faunas: the first is that of the Tierra del Fuego region, and is represented by twelve species, including one new species of *Notothenia*; the second fauna is that from the Falkland island and Burdwood bank, where the expedition obtained fourteen species, of which two are new and two are represented by new varieties. The third division includes the fish of South Georgia, whence the expedition brought back thirteen species, making up its fish fauna to eighteen species, of which nine are endemic and four more are represented by new subspecies; the additions to the South Georgian fishes made by the expedition include four new species, for one of which the author establishes a new genus, *Artedidraco*. Two of the species obtained near South Georgia were collected by the *Southern Cross* in the Ross sea, but they are represented by special varieties. The last fauna, that of the Antarctic seas, is represented in the Swedish collections by seven species, of which two are new and two are new varieties; three of them had been obtained by the *Southern Cross* off Victoria Land. The last chapter of this memoir is devoted to various pelagic fish collected during the voyage. The expedition obtained six new species, but only one of them was from high southern latitudes. In addition to the systematic descriptions, Lönnberg gives an account of the propagation of that characteristically Antarctic family, the Nototheniidae, a contribution to what the author describes as the hitherto unknown life-history of the Antarctic and sub-Antarctic shore-fish.

Of the contributions of the expedition to invertebrate Antarctic zoology, four parts have been issued in addition to one on some Decapoda from Tierra del Fuego and the Falkland islands. Prof. Michaelsen (Part III.) has described the Oligochaeta, including two new species from

the Falkland islands and one species, *Phreodrilus crozetensis*, from South Georgia, a species which the author had previously founded upon specimens collected by the *Gauss*.

The Oladocera and Copepoda are described by Dr. Ekman, who divides the fauna into two groups, one including the three sub-Antarctic localities, Tierra del Fuego, the Falkland islands, and South Georgia, and the other the truly Antarctic locality of Graham Land. The collection includes twenty species, of which five are new, and one is made the type of a new genus, *Gigantella*. Several of the species are cosmopolitan, and some are known from Northern Europe and Greenland. Hence, as usual, the evidence of these small crustacea is not very instructive on problems of geographical distribution; the author states the available facts as to the relations of the species collected to those of South America and Australasia.

Among the higher crustacea, the Anomura and Brachyura are described by Lagerberg, but the sixteen species included in his report were all from the Falkland islands or Tierra del Fuego.

The hydroids are described in an elaborate and beautifully illustrated memoir by Dr. Jäderholm, who now supplies full information, supplementing a preliminary account in which he described sixteen new species. In the official memoir he describes three more new species, making a total of fifty species collected by the expedition. Thirteen species, and one only doubtfully identified, came from the Antarctic seas; but some of the Antarctic hydroids also live in Arctic and North European seas, but as so many hydroids are cosmopolitan, their distribution is of comparatively little significance.

The last part issued of the fifth volume is an account by Dr. Wahlgren on the Collembola. Of these insects the expedition collected forty-four new species, of which eleven are new and one is a new genus. Four of the species came from Graham Land, and the rest from Tierra del Fuego and the sub-Antarctic islands.

Of the botanical memoirs on the work of the Swedish expedition six parts have already been issued. The first, by Stephani of Leipzig, is a short catalogue of the liverworts, including seventy-eight species, of which five are new. He divides them into five floras, of which the two smallest are those found on Antarctica (four species) and on South Georgia (sixteen species). Only one of the truly Antarctic species is new, and that was collected also on the South Shetlands.

The remaining parts of this volume are by the botanist of the expedition, Dr. Carl Skottsberg. Parts Nos. 2 and 4 deal with the flora of Tierra del Fuego, and are therefore only indirectly connected with the Antarctic. Part No. 3 is a memoir by Dr. Skottsberg on the vascular plants of South Georgia, and is interesting in reference to plant distribution. The flora consists of nineteen species, none of which are endemic. They are all found on Tierra del Fuego, and it

appears at first strange that so few vascular plants should have reached South Georgia. Skottsberg solves the problem by reference to the glacial history of South Georgia, for the work of Dr. Gunnar Andersson shows that the whole flora must have been exterminated by ice; Skottsberg accordingly explains that only species, of which the seeds can be transported by wind or birds, have been able to recoccupy South Georgia.

The longest of the botanical memoirs yet issued is the first part of Dr. Skottsberg's monograph on the sub-Antarctic and Antarctic marine algae; this part includes only the *Phaeophyceae*. In this section of the algae, fifty-nine species were collected by the expedition, and these are described in a memoir of 172 pages with ten plates, a map of the world illustrating oceanic circulation, and 187 figures in the text. The expedition obtained sixteen new species and four new genera; one new genus has such abnormal characters that its affinities are quite uncertain, and the other is made the type of a new family, the *Ascoseiaceae*. The author divides the floras into an Antarctic group, including ten species, a sub-Antarctic group, and a group of species of very wide distribution. Eleven species were found in the Graham Land region; two among them are included in the collections from the Ross sea. Dr. Skottsberg describes the seasonal relations of the flora, and points out that the marine algae are quite abundant in the winter. This memoir makes it evident that amongst the colossal seaweeds of the Southern ocean there is still a rich harvest of new forms.

The calcareous algae are described in a short report by Foslie, entitled "Antarctic and Sub-Antarctic Corallinaceae." The collection includes thirteen species, of which three are new. Seven of them belong to *Lithothamnion*. The author of the report discusses the relations of the marine floras on the eastern and western sides of the Antarctic continent. With the present imperfect knowledge there may be a tendency to exaggerate the difference between the life of the two regions. M. Foslie points out that of known calcareous algae, only one species occurs in both, and it is a small epiphytic form that may easily be carried on floating weeds; none of the attached species is found on both the shores of the Ross sea and Graham Land. The author, however, considers that a more thorough knowledge of the Antarctic calcareous algae would probably prove a closer connection between the western and eastern floras than is indicated by the material at present available.

#### THE PROBLEM OF BIPOLARITY.

The problem of most general interest which these collections elucidate is Sir John Murray's theory of bipolarity. The work of the four expeditions does not add much evidence in its support, though considerable differences of opinion are expressed on the subject. Whereas,

however, the opinions in its favour are hesitating and vague, those on the contrary are explicit and most emphatic. The authorities who give tentative support to the theory include Sir Charles Eliot and Mr. Hodgson. Sir Charles Eliot says, in reference to the Arctic and Antarctic nudibranchs, that "as far as the faunas are known," they "show considerable general resemblances," and he adds later "that the Arctic and Antarctic nudibranchs are similar rather than identical." He is much more emphatic in support of bipolarity in his report on the pteropods. Therein he says, "Whether we call the Antarctic forms varieties or species is, in reality, a comparatively unimportant question. That there are some differences of detail between them and the Arctic forms every one will admit; that the two sets of forms are nearly related is equally clear. The interesting point is that in both the Arctic and Antarctic seas the predominant, and as we approach the poles probably the only, pteropods are closely allied or even identical species of *Limacina* and *Oliane*. The characters which these Arctic and Antarctic forms present are compatible with any hypothesis which assumes that they are derived one from the other, or from a common ancestor. Further, the distribution of the forms is interrupted by a wide zone in which they do not occur. None of them are recorded from within thirty degrees either north or south of the equator. I confess that I have no explanation of these facts which appears to me satisfactory."

Mr. Hodgson, in his report on the pycnogonids, advances one of his twenty-eight species as bearing upon the bipolarity question; for *Colossendeis australe* is much more nearly related to the Arctic *C. proboscidea* than to any other species, and he asks, "How is their present position at the opposite ends of the Earth to be accounted for?"

The evidence against bipolarity varies from the mild objection of Mr. A. E. Smith, that the mollusca fauna "does not show any particular resemblance to the Arctic fauna; indeed, the majority of the genera have almost a world-wide distribution," to the emphatic condemnation of Dr. Trouessart, who says the theory is belied by the facts that all the species common to both polar regions are cosmopolitan, and have been slowly transported from one area to the other. He concludes that "en définitive le bipolarité n'existe pas." Dr. Calman discusses the question in reference to *Crangon antarcticus*, which had been regarded by Ortmann as a near ally of the North Pacific species, *C. franciscorum*, that had reached the Antarctic seas by migration southward along the western coasts of America; Dr. Calman, after careful comparison of the two species, concludes that the resemblances are of no "great morphological importance," and he indicates marked differences between them; and he points out that Prof. Coutière, in his monograph on the decapods collected by the *Belgica*, proposes to make the Antarctic species a new genus *Notocrangon*. Some of the authors on the collections of the

*Gauss* also refer to bipolarity, such as *Meisenheimer* in his report on the Pteropoda, and *Lohman* on the Acari, and they both oppose the theory.

In the report on the rich collection of echinoderms collected by the Scottish expedition, Prof. *Koehler* is almost as emphatic as Dr. *Trouessart*; he remarks that the question of bipolarity "est jugée depuis longtemps," and he holds that the Arctic and Antarctic echinoderm faunas are completely different.

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## A CONTRIBUTION TO THE TOPOGRAPHY OF NORTH-WESTERN GREECE.\*

By the Rev. Canon C. M. CHURCH and Prof. J. L. MYRES.

THE north-western corner of free Greece, the shores of the Ambracian gulf, have been but little, if at all, explored by the traveller since the time of Colonel *Leake's* travels in Northern Greece, now a century ago—1809. No tourist has left any detailed account of that district since that same time when *Byron* and *Hobhouse* landed from *Prevesa* on the southern shore of the Gulf of *Arta*, "where lone *Lutraki* forms its circling cove," and traversed "*Acarnania's* forest wide," and "marked the scenes of vanished war—*Actium*, *Lepanto*," † scenes of the two decisive naval battles fought off the shores of *Acarnania*.

It is difficult to find any description, by pen or pencil, of what *Leake* with unwonted fervour describes as "that beautiful inland lake" of *Arta*; or of "that remarkable mountain of the *Macrynoros*," which rises precipitously at the head of the lake above its eastern shore to the height of more than 2000 feet, and whose passes form the key to continental Greece—the *Thermopylæ* of the western coast. Through these passes over the mountain, and by the cornice road along the declivities above the shore, the Turkish pashas of *Ioánnina* from time to time poured their Albanians into Greece. Twice in the war of Independence the Greeks held the passes successfully against the Turks—first in 1821, at the outbreak of the revolution; and in its last year, 1829, when the Greeks under General *Church* surprised the passes, cut off the communication with the fortresses of *Mesolonghi* and *Lepanto*, forced the surrender of the garrisons, and the evacuation of the provinces of *Acarnania* and *Ætolia*, and ultimately obtained the inclusion of those western provinces within the boundaries of the Greek Kingdom in 1832.

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\* Map, p. 52.

† It is well known that the so-called "battle of *Lepanto*" was fought off the *Curzolari* islands, at the mouth of the *Acheloo*s (*Aspropotamos*), on the south-western shore of *Acarnania*.

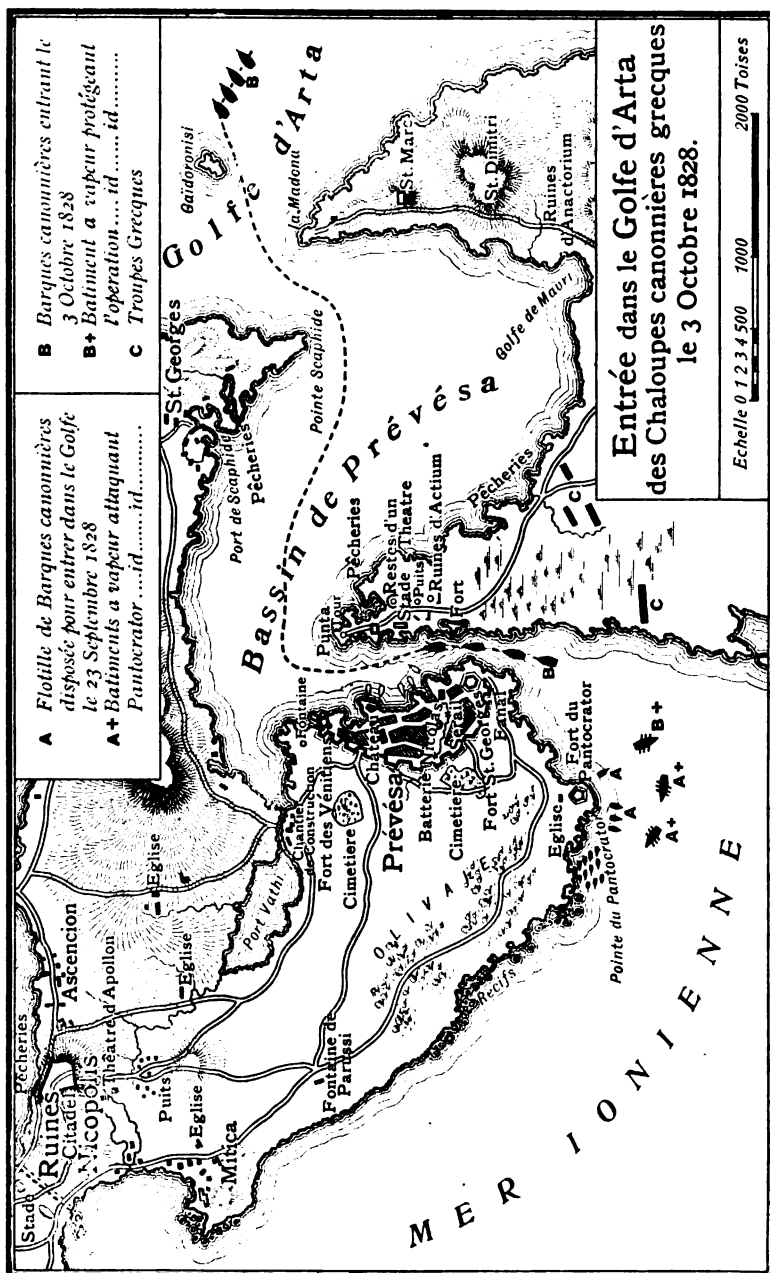


FIG. 1.—THE FORCING OF THE STRAITS OF PREVESSA BY THE GREEK FLOTILLA.

These operations, like the country in which they occurred, have passed almost undescribed hitherto. Finlay, for example, dismisses them in a couple of lines. The passage of the Greek squadron under

the batteries of Prevesa "secured to the Greeks the command of the Gulf of Arta. The town of Vonitza, a ruinous spot, was occupied by the Greek troops on December 27, 1828, but the almost defenceless Venetian castle did not capitulate until March 17, 1829. The passes

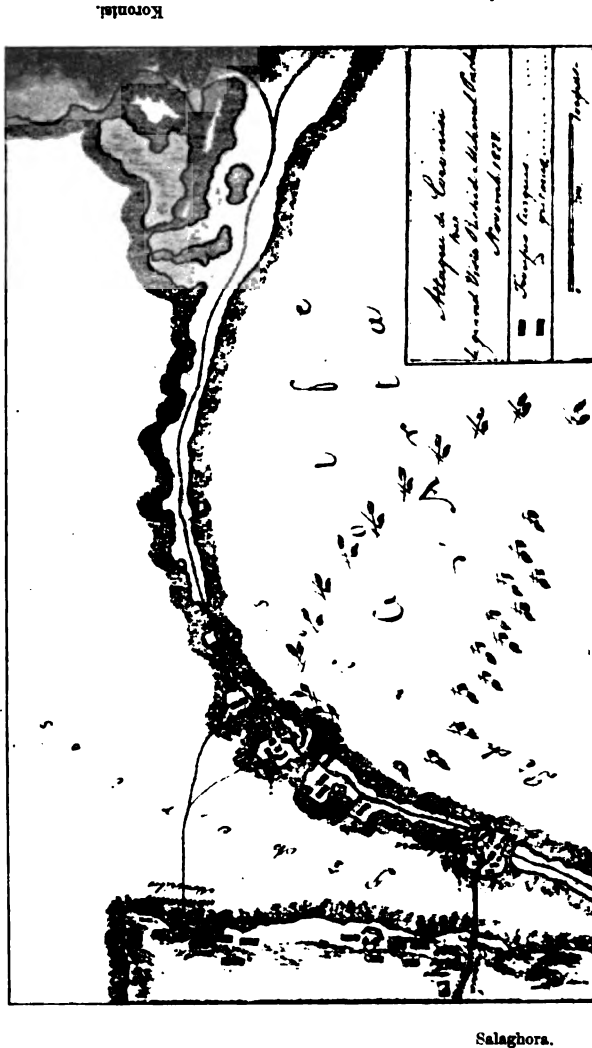


FIG. 2.—NORTH SHORE OF GULF FROM SALAGHORA TO KORONISI.

of Makrynoros were occupied in April."\* The campaign, however, as will appear, is not without military as well as topographical interest.

The accompanying plans, selected from the papers of General Sir R.

\* 'History of Greece' (ed. Tozer, Oxford, 1877), vol. 7, p. 39. For a general view of the field of operations, see Fig. 7, p. 54.

Church, now in the British Museum, were drawn by Captain Jochmus, a Bavarian officer, who was aide-de-camp to General Church in 1828-9, and afterwards lieutenant-general in the Austrian service. Some other plans illustrative of Greek topography, made at the same time by the same officer, and contributed by him in later years, are to be found in the *Journal* of the Royal Geographical Society, vol. 27, p. 1. In the dearth of any plans of the topography of this particular district of the Macrinoros and the Gulf of Arta, these plans may be worthy of notice. The incidents represented in them are as follows:—

*The forcing of the straits of Prevesa by the Greek flotilla* (Fig. 1). This took place in October, 1828. This action gave the Greeks possession of the Gulf of Arta.

*The occupation of the thread of land from Salagora to Koronisi* (Fig. 2) was the next in this series of operations. The northern side of the gulf, which forms the foreshore of the fertile plain of Arta, is formed by a series of small islands and peninsulas, separated by lagoons which are often wholly landlocked. Open anchorages off Salagora and Koprena served as the ports of Arta, and possible means of communication with Prevesa by sea. About halfway between them lies the island of Koronisi, which, communicating with the mainland by two nearly continuous sandbars—one north-westward to Salagora, the other north-eastward round the Logari lagoon—offered at the same time an advanced base and post of observation for the Greek squadron, and a secure refuge for the numerous Greek families from the plain. Koronisi was accordingly occupied, and reinforced now by a detachment under General Church himself. The sketch is of some interest, because, since 1828, the coastline has advanced appreciably and the outline of the sandbar has altered also.

*The capture of Vonitza* (Figs. 3 (plan) and 4 (view)) was the work of General Church. Vonitza lies in a strong position about halfway between Lutraki and Prevesa, and commands a knot of roads communicating with the interior of Acarnania, and also with the ports of Leukas and Zaverda on the open sea.

The castle occupies an abrupt and isolated hill on the eastern side of the entrance to a land-locked bay. It is connected with the mainland by a broad stretch of alluvial ground, liable to floods in winter. Readers of Thucydides will recall the situation of the Megarian Minoa, save that the civilian quarter of Vonitza lies round the landward base of the citadel, and along the shore to the eastward, while the steep western arm of the land-locked bay, opposite the Vonitza castle, is unoccupied except by a monastery. The view (Fig. 4) reproduces a picture which hung in General Church's library at Athens in 1848. It is taken looking east towards Vonitza castle, from a point on the shore of this bay, between the words "Bras de la mer" on the plan, and the monastery, a ruinous angle of which appears beneath the tree in the foreground.

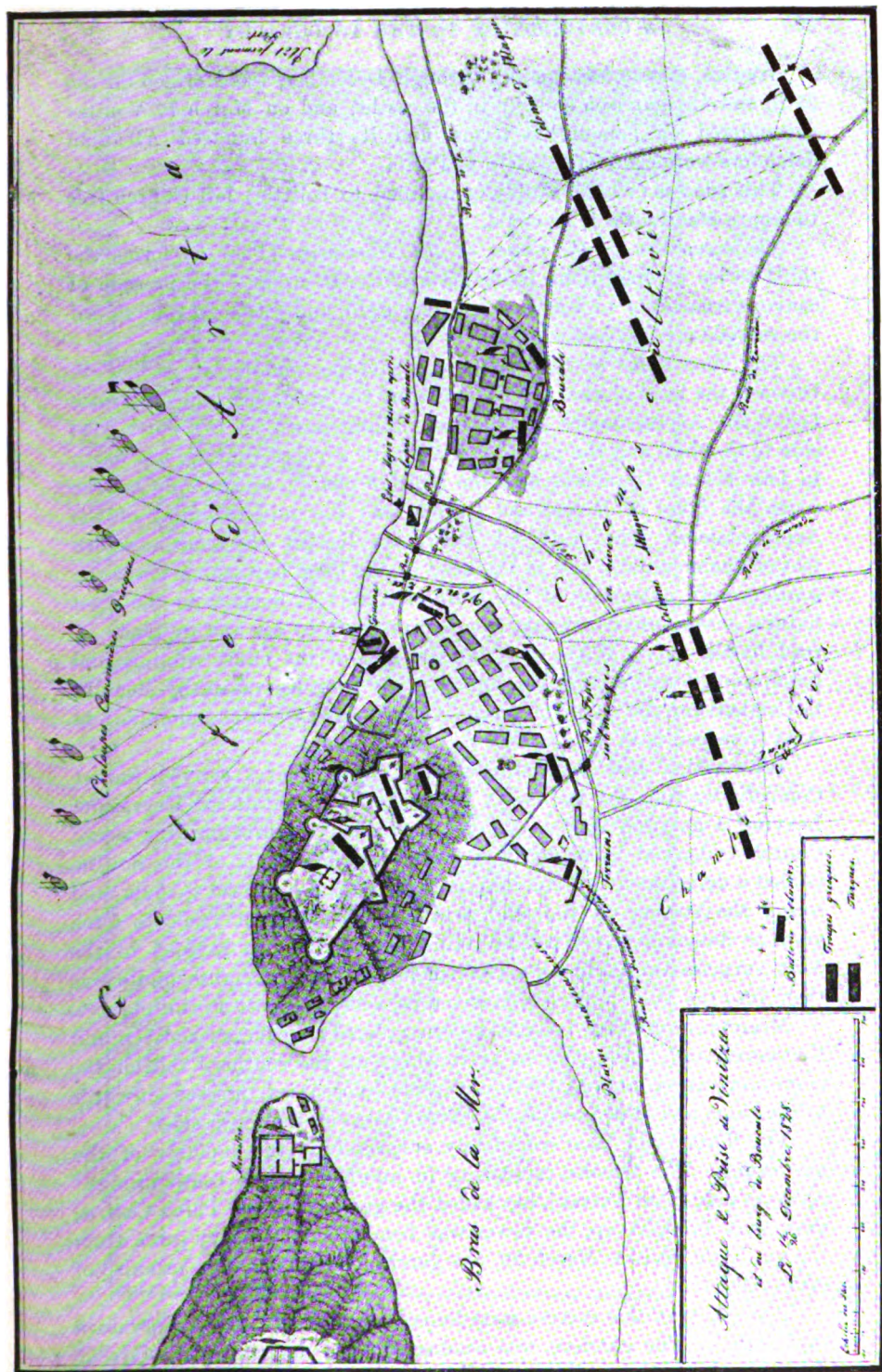


FIG. 8.—ATTACK OF VONTZA.

Vonitza, closely besieged all through December, was stormed on the 27th, and the garrison shut up in the castle; and on March 17 Vonitza surrendered on honourable terms, and its three hundred Albanian defenders were conducted safely to Punta.

This success (which Finlay is inclined to belittle) left Church free to secure Macrinoros if he could.

*The occupation of the passes of the Macrinoros* (Plan 5) forms the third series of operations indicated above. It stopped the passage of convoys from Arta to Kervasara, Mesolonghi, and Lepauto, and forced the surrender of those fortresses.

The Macrinoros is the range of mountains and forest wedged in between the head of the Gulf of Arta on the west, and the deep-sunk bed of the Aspropotamos on the east, falling down on the north-west side to Comboti and the plain of Arta, with a ridge running up north to join Mount Djumerka and the Epirote chain; overlooking on the south the lakes of Rivios and Ozeros, and the middle valley of the Aspropotamos. The castle of Kervasara lies at the south-western foot of the mountain, and at the head of the long bay which forms the south-eastern extremity of the Gulf of Arta. It commands the most natural access into Acarnania from Epirus both by sea and by land. A road by the shore of the gulf, at the foot of the cliffs, winding and precipitous, forms a pass of a day's journey from Kervasara by Menidhi to Comboti on the plain of Arta. Other tracks cross the mountain to Arta from points in the basin of the Aspropotamos.

Information had reached General Church that a convoy was at Comboti, waiting for an escort to cross the mountain to Kervasara. Leaving a garrison in Vonitza, and some men to threaten Kervasara, Church embarked by night from Lutraki in the boats of the flotilla, landed a detachment at Menidhi, midway on the cliff road to Arta, and seized the station on the road, while the boats went back to fetch another detachment. His men, climbing the western ravines in the dark, surprised at daybreak a Turkish outpost on the heights, and drove them into the Paleo Castro of Macrinoros, a fortified post on the plateau.

Meanwhile another body had been ordered to make a circuit round Kervasara, and to advance as skirmishers up the southern face of the mountain; these finding the lower posts unoccupied, pressed onwards to the ridge and closed round the Paleo Castro on the south side.

The Turks had been completely surprised by the rapidity of the movement. The Greeks, increasing in numbers as the boats brought up fresh men from Lutraki, blockaded the garrison in the Paleo Castro; guns were brought up, the tower was bombarded by heavy guns from the gunboats, and on March 29, the garrison surrendered on promise of safe conduct.

The effects of this success were immediate, and on April 7 Kervasara capitulated. The garrison was conducted by a detachment of Greeks

[To face p. 48]



along the coast road by Menidhi through the Greek camp to the entrance of the plain of Arta, and the sick and wounded and baggage were taken across in the Greek boats to Coprena.

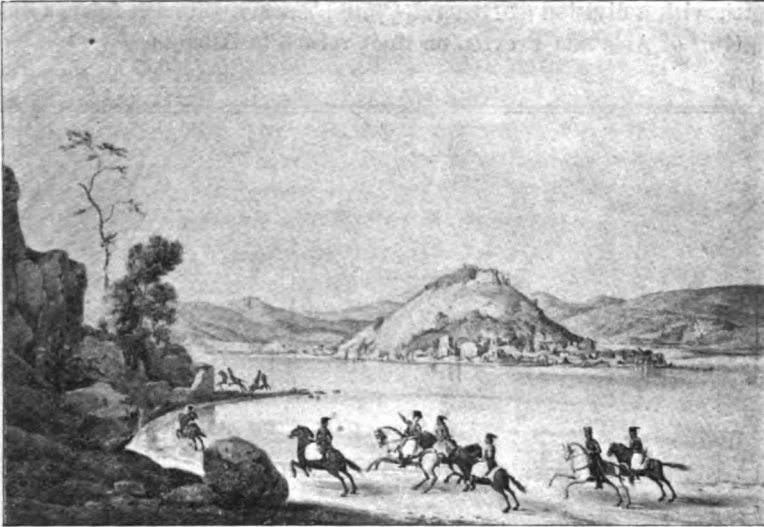


FIG. 4.—VONITZA CASTLE FROM THE SOUTH-WEST.



FIG. 6.—ARGOS AMPHILOICHIMUM.

So, within a fortnight of the fall of Vonitza, the Greeks had seized and occupied the passes of the Macrinoros, and the fortress which was the key of the province of Valtos.

The garrisons of Lepanto and Mesolonghi were now cut off from hope of relief, and, suffering from want of provisions, they capitulated, Lepanto on April 30, Mesolonghi on May 17. Their garrisons, the last body of Turkish troops remaining in Acarnania, were escorted by Varnakiotti, with a division of General Church's army, through Acarnania to the Gulf of Arta and Prevesa on their return to Albania.

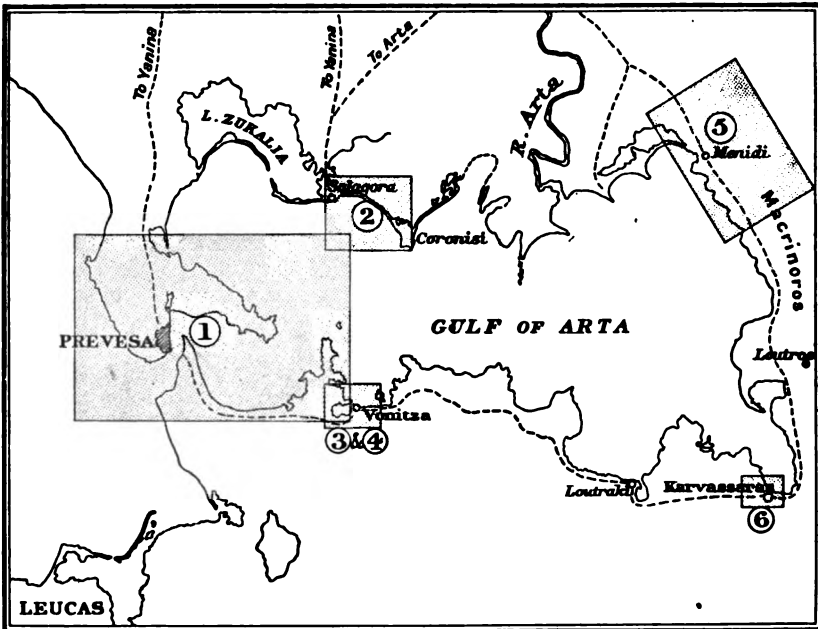


FIG. 7.—GENERAL SKETCH-MAP SHOWING THE AREAS COVERED BY FIGS. 1-6.

The last diagram (Fig. 6) represents an ancient fortress on the shore at Kervassara, very completely preserved. The sketch is labelled "Argos Amphilokicum" (Amphilochicum), but the true site of this name lies some miles further north, up the east coast of the gulf, in the last considerable valley which is crossed by the coast road before it reaches the cornice of the Macrinoros. It is also at some distance from the sea. The nearest ancient site to Kervassara is Limnæa, a mile or two southwards up the valley which connects Lake Rivios with the gulf.

## CAPTAIN AYLMER'S JOURNEY IN THE COUNTRY SOUTH OF THE TANA RIVER, EAST AFRICA.\*

WE have received through the Colonial Office, from the Government of the British East Africa Protectorate, a detailed account of a journey from Kibwezi to Kitui, which was carried out last year by Captain L. Aylmer, of the King's African Rifles. The journey led through the little-known country between the Athi and the Tana rivers, where existing maps vaguely show the upper courses of the Tiva (or Nsao) and the Thua (or Nsua) rivers. Two or three travellers have followed routes near to that traversed by Captain Aylmer. Dr. J. L. Krapf, Dr. J. G. Kolb, and the late Mr. A. H. Neumann passed a little to the west, while Dr. Kolb, on his expedition in 1895-96, seems to have gone over much the same ground between the Tiva and the Thua rivers that Captain Aylmer has now covered. The latter, however, has accomplished an interesting bit of work by tracing the course of the Tiva for a considerable distance below Ikutha. Native reports as to where the river flowed have been of a very conflicting character, some describing it as a tributary of the Tana, others giving it a separate outlet to the sea near Kipini, and others again affirming that it ended abruptly in the desert. In 1906, parties in charge of native police officers were despatched both from Kitui and from Lamu with the object of settling the question, but accomplished practically nothing. The party under Captain Aylmer left Kibwezi, on the Uganda railway, early in July of last year, about a month after the end of the rainy season at Nairobi. It was found, however, that the rains occur earlier in the country explored than in the highlands, and since also the fall had been less than usual, the expedition was considerably hampered in its movements by the scarcity of water.

The first day's march from Kibwezi brought the expedition to the Athi river, and another day's march to Ikutha, on the Tiva river, where a German mission station has been established. On setting out from Ikutha to explore the course of the river downwards, Captain Aylmer was accompanied by thirty-nine porters—Wanyamwezi, Wakavirondo, Wakikuyu, and Wakamba. Of these the Kavirondo men were a conspicuous failure, while the Wakikuyu, though behaving well, proved to be very susceptible to fever. Generally, the Wanyamwezi are considered to be the best porters, but Captain Aylmer considers that in bush country the Wakamba and other tribes, who carry their loads slung on the back from a strap over the forehead, are preferable to either the Wanyamwezi or Swaheli, who carry their loads on their heads, and continually have to lower their burdens in order to pass under the overhanging bush. The river-bed was dry, except for occasional pools, the water in which

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\* Map, p. 120.

was brackish but not unwholesome. Inquiry elicited the information that the river never flows for more than a few days at a time, though sometimes after rain the rush of water is so great that it is difficult, if not impossible, to cross from one bank to the other. On the maps it has been customary to mark here and there the occurrence of falls in the river, but nowhere along that section of the course explored by Captain Aylmer was any place observed to which that description could be applied. Possibly, however, when the stream is flowing its course is broken by rapids along stretches where the rocks outcrop. Below Ikutha the sandy bed of the river, averaging in width from 25 to 35 yards, winds between the Yatta hills on the right or western bank, and the lower spurs of the Ukamba hills on the east. On either side it is bordered by a belt of dom palms and other large trees, interspersed with green vegetation, and beyond this belt extends thick thorn bush country. Here and there, where a rocky spur comes down from the hills, the trees along the banks give place to the bush, and not infrequently the rocks form a barrier right across the river, holding back a perennial supply of water in deep pools. Round about these pools were observed numerous tracks of big game, including elephant, lion, rhinoceros, and leopard; but most of the tracks were a week or ten days old, and Captain Aylmer thinks it not improbable that most of the game had removed to the vicinity of the Sabaki, or lower Athi river, where there is a more permanent supply of water.

Nearly midway between the 38th and 39th meridians of east longitude the Tiva river, which has followed up to that point, from its source some 15 or 20 miles north of Kitui, a generally southerly course, though with a growing easterly trend, takes a sharp turn to the east, and continues at right angles to its former course. About 20 miles lower down it is crossed by the native trade route from the Sabaki to Kitui, and a few miles beyond the river-bed was found by Captain Aylmer to be split into numerous small channels, which disappeared into a patch of very thick forest extending about 8 miles from west to east by 4 miles from north to south. This forest the branches of the river traverse lengthwise, re-uniting on its eastern borders, and continuing as before, though the channel is smaller and more overgrown with vegetation. The bush, which had made travelling very difficult and confined the expedition for the most part to the bed of the river, had gradually become more open as the expedition advanced eastwards, and on the eastern side of the forest, in about 39° E., dom palms and forest trees occurred only here and there along the banks, the course of the Tiva lying between open flats of soft cotton soil bounded by slightly rising ground covered with bush. The soil is mostly of the reddish variety, and with irrigation would be very fertile. Game was fairly plentiful at the time of the expedition's visit, and Captain Aylmer describes the number of birds as almost miraculous. Every

morning about seven o'clock the air was thick with doves coming to water; spurfowl, partridge, and guinea-fowl were to be seen everywhere, and the lesser bustard, sandgrouse, and a few pigeons were also observed. Both birds and animals were extremely tame, taking scarcely any notice of human beings, and not in the least disturbed by rifle-shots. Throughout the journey bees were a perfect pest in camp, though the native porters seemed to be impervious to their attacks, and would rob their nests for honey without any protection. Among trees and bushes various species of thorn were the most abundant, but near the river-bed there also occurred, in addition to the dom palm, the tooth-brush tree, the umbrella-shaped acacia, the bushy evergreen called by the Somalis "gurus," which is invaluable to travellers in bush-country, as it is easy to climb and affords a good view from the top; and the candlestick tree (*Candelabra euphorbia*), which was welcome as one of the few kinds of trees giving any shade from the sun, and which also served as a guide to the course of the river, growing all the way along at a distance of about half a mile from the banks. Baobabs were conspicuous by their absence along the lower river, though numerous near the hill country. Captain Aylmer notes that the nuts of the dom palms differed from those found at Mombasa and elsewhere along the coast, being larger and not sweet, but rather unpleasant to the taste.

North of the forest was found a group of half a dozen water-holes surrounded by dense thorn-bush, and accessible only by the paths trodden down by elephant and buffalo. The water lasts only two or three months after the rains, and was nearly exhausted when the expedition left, after encamping there for ten days. No water was discovered in the river-bed east of the forest, but native report represented the Tiva as ending in a lake three days' march from the forest, and while the expedition was encamped at the water-holes, Captain Aylmer, with a picked body of men, started off to verify the information. A day was lost through the party losing the course of the river; water was running short, and one of the party was attacked by dysentery. Captain Aylmer was therefore obliged to turn back in about 39° 30' E., when a few miles short of the reported position of the lake, after a journey of about 50 miles from the water-holes north of the forest. Fairly recent elephant tracks and fresh rhinoceros tracks were observed at the point of turning, but the course of the river was scarcely recognizable, being merely a series of channels in a bed overgrown with reedy grass and bush, perhaps half or three-quarters of a mile in width. There were no signs of natives nor any indication that they had been there for a long time past.

On the return journey the expedition struck north from the Tiva at the point where it is crossed by the track from the Sabaki. For two days' march the track ran through dense bush country, where

even along the path it was impossible to walk upright for more than a few yards at a time. The only water—greenish in colour, but cool and not bad to the taste—was found in holes at the end of each day's march. Not until early in the third day's march was there any sign of human habitations. Then the expedition came upon an outlying Kamba village of the Gagindu district, and thence onwards the road wound from one inhabited district to another. The supplies of water were still of the scantiest, and Captain Aylmer found the Akamba living in fairly well-defined communities, adjacent to some water-supply, which was usually a spring in the mountains, dammed a few yards from its source so as to provide a drinking-place for the native cattle. Sometimes these settlements were separated from one another by a distance of seven or eight hours' march, the intervening country being quite devoid of inhabitants. One day's march from the Gagindu district brought the expedition to the Mudtha district, and another day's march to Vor, on the Thua river. This river Captain Aylmer describes as similar in its characteristics to the Tiva, but considerably larger, averaging 50 yards in width. Continuing northwards along a bend of the Thua, the expedition entered the Sombi district, where a good supply of sugar-cane is grown, together with bananas and other food stuffs. Several streams descend from the Mutuluni hills in the west and the Mutito hills in the north to join the Thua in the Sombi district, fertilizing the soil, and giving the country a rich and prosperous character. The bush round Sombi is still very dense, but the country is more open on the north side of the river towards the Mutito hills. For a few miles beyond Sombi the trade route to Kitui follows the south bank of the Thua, and then branches off westwards and ascends the Mutuluni hills, from the top of which the Government station at Kitui can be seen about 6 or 7 miles away. The eastern slopes of the Mutuluni hills are uninhabited, but the country at the top supports a numerous population extending all round Kitui. The climate is appreciably cooler than in the river valley, though there is only about 1000 feet difference in the elevation. At Sombi Captain Aylmer found the nights pleasantly warm, and was able to dispense with blankets, whereas after ascending the Mutuluni hills he found that three blankets were not too many for comfort. No game was seen after leaving Sombi, where it was fairly plentiful, and where the natives complained of the damage done to their crops by elephants.

According to native report, the Thua runs into the Tana, and Captain Aylmer also learned of the existence of a lake called Utisi, situated four marches down the Thua and one away from it in a southerly direction. This lake is a favourite resort of native elephant-hunters, and several of the Akamba declared that they had visited it. They hunt with bows and poisoned arrows, and are said never to make

use of spears. A curious custom of theirs, when fighting, is to give quarter to a defeated enemy if the latter catches his opponent's breast in his mouth. The Akamba file their teeth in two ways. Among some of the tribes it is the custom to file all the front teeth to a needle-like point, the effect being extremely repulsive, while among others only the insides of the two middle front teeth are filed. All of them drink enormous quantities of *tembo*, an intoxicating liquor of which there are two varieties—one made from sugar-cane and bananas, while a better kind is made from fermented honey. The old men, according to Captain Aylmer's observations, appeared to be seldom sober, and the spirit is of such bad quality that they soon acquire the most debauched appearance. They have the reputation of being fond of poisoning strangers, and on the whole are a trying people to deal with; but if their assistance can be secured, they will often work hard and willingly, and display a good deal of intelligence.

A plane-table was carried by the expedition, but, owing to the character of the country, it was found impossible to use it effectively. Viewed from any elevation, the country might easily have been mistaken for the sea. There was not a break in the horizon, and nothing to be seen but a shimmering blue haze above miles and miles of dry bush. Compass bearings were taken along the Tiva river, but even in these allowance must be made for a considerable margin of error, owing to the absence of prominent points. The usual difficulty was experienced in ascertaining the native names for particular features, but Captain Aylmer succeeded in compiling a useful list of the general names for "river," "lake," "hill," etc. A collection of rock specimens found by the expedition contained nothing of value. Quartz abounded everywhere, but no shale formation was seen which gave promise of coal.

In its main purpose, to trace the Tiva river throughout its lower course, the expedition failed; but useful experience and knowledge of the country were gained, and Captain Aylmer believes that another attempt made immediately after the rains in a good year would undoubtedly prove successful, and the exact courses of both the Thua and the Tiva rivers would be located.

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## THE GEOGRAPHICAL DISTRIBUTION OF RAINFALL IN THE BRITISH ISLES.\*

By HUGH ROBERT MILL, D.Sc.

In considering the geographical distribution of any condition over a given area, the first essential is a clear view of the position and

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configuration of the area in question. The importance of the position of the British Isles from the point of view of climatology, and especially of rainfall, lies in its relation to the continent on the east and the ocean on the west, in the track of the prevailing south-westerly winds which blow from ocean to continent, carrying warmth and wetness to the land they first encounter. Ireland, standing well to the west of the larger island, and thus enjoying the more oceanic climate, is remarkably open to the sweep of the wind. The central plain is practically continuous, broken only near the edges by the mountain groups of the north-west and the north-east, and by the more compact masses of high land which run through the south of the island from south-west towards north-east, forming a fairly continuous highland belt from Kerry to Wicklow. Great Britain shows a more elaborate vertical relief, the great groups of high land being clearly marked off from one another by plains narrower than that of Ireland, but, like it, stretching in most cases from sea to sea. In order, from north to south, the lofty land-masses include the Highlands and the Southern Uplands of Scotland, each filling nearly the whole breadth of the country and separated by the Lowland Plain, with its lines of low ridges and abrupt bosses of volcanic rocks. Lying, as Scotland does on the whole, to the west as well as to the north of England and Wales, it possesses distinct differences in climatic character from South Britain. The southern and larger part of Great Britain may be best divided into a western and an eastern division. The Western comprises the separate highland masses of (1) the Lake District; (2) the Pennine Chain; (3) Wales; and (4) the western horn of Cornwall and Devon. These four groups of elevations are separated by low plains, over which the rivers, taking their rise in the high ground, pass to the sea. The Eastern Division is, in the main, a plain traversed by long ridges of low hills of well-marked individuality radiating from near the Bristol Channel to the north-east and east. The line commencing with the Cotteswold Hills stretches, now higher, now lower, to the moors of the North Riding of Yorkshire. The next line, including the White Horse Downs and the Chiltern Hills, though broken by the flat of the Fenland, rises again in the Wolds of Lincolnshire and the East Riding of Yorkshire; while the third line runs broadly through Salisbury Plain and splits into the curved sweep of the North Downs and the South Downs, with the Forest Ridges between them, each of the members of the system being defined and separated from the others by narrow plains. The river systems of the country emphasize the divisions of the plain, which bounds the masses of high ground and serve as the most natural units of surface for the discussion of rainfall data. Taken as a whole, the vertical relief of the land is the effective agent in directing the action of wind and all climatic conditions arising from the effect of aspect, shelter and direction of movement.

Before bringing into relation the land and the rain, it is necessary to consider the character and causes of the latter. The term "rain," for purposes of measurement, includes all forms of condensation of water from the atmosphere, not merely the fall of liquid drops. The principal agent for the transformation of solar radiation into work is water, which, evaporated from the surface of the hydrosphere, ascends as vapour and is condensed and precipitated whenever it reaches a height where the temperature is below the point of saturation, and when appropriate nuclei are present, upon which condensation of water can take place. These nuclei are usually considered to be supplied by dust; but it is now suggested that the part may be played by electrons also. While it is the lowering of the temperature of air which produces condensation of the aqueous vapour into water, the most usual cause of fall of temperature in masses of air is the ascent of the air either by expansion, due to heat or release of pressure, or by wind blowing along the rising slope of a land surface; ascending air may thus be looked upon as practically the only cause of rain. When condensation takes place in minute globules, the friction exercised by the air retards their fall so greatly that they often appear to float as clouds; but the apparent stability of a cloud is frequently an optical effect due to the formation of fresh cloud above and the simultaneous evaporation of the water globules below when they fall into air which is not saturated. In a cloud formed in saturated air the globules have an opportunity to run together and fall in drops, which sometimes attain a considerable size. In a cyclonic system, and still more in a whirlwind, there is a rapid ascensional movement of air, and these conditions are consequently associated with excessive precipitation; electrification also plays an important part in the production of torrential rainfall. The magnitude of rain as a working power in nature can only be realized when one remembers that all the water of every river is merely rain on its way back to the sea, whence it came.

The method of measuring rainfall is very simple, but many small precautions have gradually been discovered to be necessary in order to secure satisfactory results, and thus it happens that there are few good records of rainfall of any great length. Christopher Wren designed, in 1662, the earliest rain gauge, which has been described; but the first known record was begun at Paris in 1668, and the second at Townley Hall, near Burnley, in 1677. Very few records exist before the commencement of the nineteenth century, and our comprehensive knowledge of the distribution of rain over the British Isles may be said to have started in 1860, when the late Mr. G. J. Symons initiated the British Rainfall Organization, and in 1861 published 507 records for the year. The work of this organization is still carried on in Mr. Symons's old house, 62, Camden Square, London, but now it deals with the records of 4500 stations every year. Experiments were made in the early days to

determine the best form of instrument and the best method of observation, and the outcome was to establish the use of the Snowdon pattern of rain gauge, 5 inches in diameter, or the Meteorological Office pattern, 8 inches in diameter (the two differ only in size), set with the receiving surface 1 foot above the ground, read once daily at 9 a.m., and recorded to the date of the commencement of the twenty-four hours to which the reading refers. Elevation above the surface of the ground or exposure to strong wind causes a loss in the catch of rain, on account of ascending eddies formed round the instrument, and various sheltering devices have been employed in very exposed places to counteract this effect. Rainfall observers in the British Isles belong to all classes of society, and for the most part they do the work voluntarily on account of its interest to themselves; the efforts of the Rainfall Organization—which, unlike the state-supported rainfall services of all other countries, is a private and self-supporting body—being mainly (1) to collect the records and publish them in the annual volumes of 'British Rainfall'; (2) to encourage accuracy and regularity in observers; and (3) as far as is practicable to endeavour to enlist the aid of new observers in the large areas where as yet there are no rain-gauges. New records are urgently wanted in all parts of Ireland and of the Scottish Highlands, but also in many parts of England, such as Northumberland, the East and North Ridings of Yorkshire, in the west of Wales, and in general in all places more than 500 feet above the sea.

The first essential in mapping rainfall is to make sure of the accuracy of the individual records on which the map is based. It is a rule to which the longest experience offers no exception, that rainfall varies gradually from point to point. The gradation may sometimes be very gentle, sometimes almost abrupt; but whatever the period may be for which the rainfall is plotted, an erroneous figure stands out with manifest discordance. A map is thus a valuable means of detecting errors which may usually be corrected by inquiry or by comparison with neighbouring records. The distribution of rainfall may be delineated by means of isohyetal lines similar to isotherms or isobars, and the areas of maximum rainfall may be brought into prominence by the use of deepening tints of colour. The general rainfall or mean depth of rain over a particular area is best obtained by measuring the area between successive isohyets, multiplying the area by the mean rainfall of the zone, adding all such volumes together and dividing by the total area. In this way the difficulty of irregularly distributed stations, which would falsify an arithmetical mean, is practically overcome. In the case of mapping the rainfall of a single day—which is very often the rainfall of the natural unit, a shower—the most important precaution is to make sure that all the observations used were made at the same hour and entered to the same date. This can be done much more readily in the case of heavy than in the case of

light rains. The area enclosed by an agreed-upon isohyet to represent the superficial extent of a shower may conveniently be referred to as a "splash," and such splashes are very sharply defined in the case of thunderstorm rains, or the rain accompanying a line squall. But when the rain accompanies or is produced by a moving depression of the familiar cyclonic type, the result is a series of confluent splashes, which forms a belt across the country, and may be comprehensively termed a "smear." The smear, as a rule, lies mainly to the left of the track of a depression. A heavy shower may dominate the rainfall of a month, but in the course of a year the inequality due to any one shower ceases to appear. The peculiarity of heavy showers due to meteorological causes, such as a thunderstorm, a squall, or a cyclone, is that they depend upon the condition of the air alone, and may fall with equal intensity in any part of the country—on a mountain, on a plain, or over the sea; the configuration of the land seems to exercise no control upon them.

While the rain of a heavy shower shows no trace in its distribution of any effect of configuration or of the elevation of the land, the total rainfall of a year, whether it be relatively a dry year or a wet one, shows so complete a congruence with the configuration that there can be no doubt as to the relation of cause and effect. The highest annual rainfall is always in the neighbourhood of the highest land; the lowest is always on the low and level plains. A map of average rainfall isolates the groups of high land as areas of high rainfall, with nearly the same precision in most cases as a map coloured for elevation. The Highlands of Scotland, the Southern Uplands, the Lake District, the Pennine Chain, Wales, the western horn of Cornwall and Devon, and the mountains of Ireland, all stand out as wet areas, and even the gentle hills of the Eastern Division of England are seen to be wetter than the surrounding plain. It appears probable that after deducting from the annual total the heavy rains due to meteorological causes there remains the bulk of the rain which must be assigned to geographical causes and which is in all probability produced by the cooling of the air consequent on the uplift of the wind blowing over ascending slopes. This very reasonable deduction has not yet been rigidly proved, because it is exceedingly difficult and laborious to separate into meteorological and geographical showers the rainfall for a number of stations sufficient to allow a map of any particular year to be drawn.

The dependence of rainfall on configuration, which is apparent in the rainfall map of any year, is much more marked when the average rainfall of many years is considered. The making of an average rainfall map is beset by special difficulties. The length of the period is important because the total rainfall of one year varies greatly from that of another; and, speaking generally, the wettest year amounts to 150

per cent. and the driest to 65 per cent. of the average, and even a period of ten years may be much in excess or much in defect of the average of a longer period. The rainfall record maintained at Camden Square shows an average of 25·0 inches for fifty years; but the five consecutive decades from its commencement gave averages of 25·5, 25·5, 27·0, 24·0, and 23·5 respectively, the wettest individual year (1903) was 38·10 inches, and the driest (1864) 16·93 inches. A period of thirty-five years is the shortest time which can yield a really satisfactory average rainfall in the British Isles, and probably the rainfall of one period of thirty-five years does not differ from that of any other by more than 2 per cent. As it is impossible to make a map from the small number of thirty-five years' records which exist, it is necessary to apply a correction to the means of shorter records so as to allow for the relative dryness or wetness of the years they comprise. Reinforced by such computed data, the long records suffice for the compilation of a very satisfactory rainfall map of the British Isles to be compiled; but the labour, or, in other words, the expense, of doing so would be very considerable. The best way of making a true average rainfall map would be to prepare a complete map of the rainfall of each year since records were sufficiently numerous, and then to combine these by some mechanical method so as to produce a map on which every individual yearly total would receive due weight. The preparation of annual maps from the current year back to 1870, or perhaps to 1865, is now in progress.

Average rainfall maps of many small districts have been prepared by the method of correcting the shorter records to their equivalent averages for thirty-five years, and such maps of counties on a small scale have been published in the Geological Survey's 'Water Supply Memoirs' for Lincolnshire, Suffolk, East Riding of Yorkshire, Northamptonshire, and Bedfordshire, while they are in preparation for Kent, Sussex, Oxfordshire and Hampshire. In the case of some counties the number of observing stations is so great that it has been possible to plot the data on maps of the large scale of 2 miles to an inch. The result has been to show that the relation of average rainfall to configuration is astonishingly close, and to prove that in bare patches for which no records are available the contour lines of elevation may be taken as guides for the most probable run of the isohyets. The relation is nevertheless not altogether a simple one, as it involves altitude, slope, and exposure to the prevailing wind. It is found, for instance, that while the rainfall gradually increases with altitude on the slope facing the prevailing wind, this increase continues for a short but variable distance down the leeward slope, the suggestion being that the wind forced to rise by the slope of the ground towards the summit continues to ascend for a short distance after the summit is passed, and drops the maximum rainfall from the point where it attains its greatest height.

Reference was made in the last lecture to the economic aspects of rainfall, the damage done by floods and torrential falls, the influence of rainfall in agriculture, the rapidly increasing importance of the question of water supply for consumption in towns, and for the generation of electrical power. The problem of water supply was shown to be one of national and not of merely local importance, and it is in its main lines a geographical question which ought to be dealt with in a far more comprehensive way than the public or even statesmen yet realized.

Some instances of the manner in which rainfall had influenced architecture and processes of agriculture were pointed out and illustrated, as were all the points in the lectures, by lantern slides.

## WADE'S METHOD OF DETERMINING LONGITUDE.

By E. J. SCOTT, B.A., F.R.G.S.

MR. E. B. H. Wade, M.A., late of Trinity College, Cambridge, and at present of the Egyptian Survey Department, has devised a new absolute method of determining longitude by observations of the moon. He claims that his new method possesses advantages over the method of occultations, and gives results whose precision is second only to those obtained by telegraphic means. He recently described, at a lecture before the Survey Department at Giza, the instrument he has invented, and has now published a full account of his instrument and method in a report on 'A Field Method of determining Longitude' (Survey Department, Cairo). The accompanying plate is reproduced from that publication by the kind permission of Captain H. G. Lyons, F.R.S., F.R.G.S., F.G.S., late R.E., Director-General, Egyptian Survey Department.

The method is an adaptation of the old method of lunar distances, but no attempt is made to measure actual distances or altitudes. The observations consist in obtaining contacts between a star and the reflected image of the moon, and the only readings required are the clock times (L.M.T.) of the contacts. The principle is the determination of the times at which the moon is a certain (unknown) apparent distance first from one star and afterwards from a second. By the ingenious use of a prism, three distinct contacts of each star with the moon's limb may be timed; thus in comparison with the timing of the single instant of immersion, which alone is available in observing an occultation, there is a great reduction of the risk of error.

The instrument consists of a horizontal  $2\frac{1}{2}$ -inch telescope, so mounted on a pedestal or tripod that it may be rotated both in azimuth and about its own optical axis. These rotations are controlled by slow-motion screws, but do not require to be measured. And it is not necessary to level the telescope, the horizontal position being adopted merely for the convenience of the observer.

In front of the object glass of the telescope is a mirror (called the field mirror), whose plane is inclined at an angle of  $45^\circ$  to the optical axis of the telescope, and which is rigidly attached to the telescope. The effect of the field mirror is to reflect the line of sight through the telescope at right angles to its original direction; and it is clear that, though the telescope itself is kept horizontal, the reflected line of sight can be directed to any star by suitably moving the telescope in azimuth

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and rotating it about its optical axis. Pointing at any star is instantaneously effected by the help of a finder, a small telescope fixed at right angles to the big one, so that its axis is parallel to the reflected direction of the line of sight of the latter.

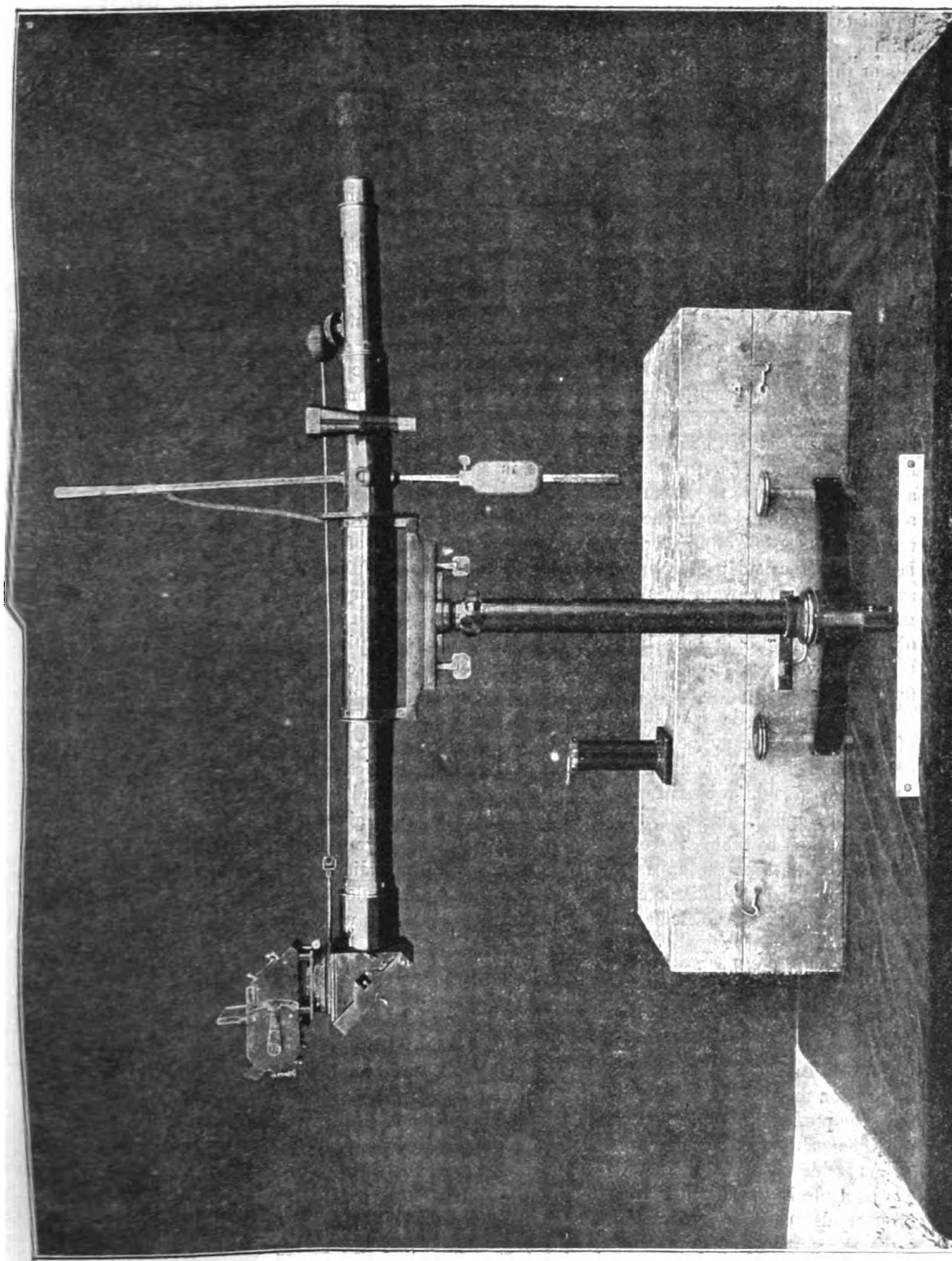
On the top of the object glass end of the telescope, and directly opposite to the field mirror, so that the reflected line of sight must pass through it, is a box which is practically a box sextant, and is so called. By a very conveniently arranged tangent screw, the box sextant may be rotated about the reflected line of sight as axis. As the bearings on which the box sextant revolves are fixed, a test is necessary to determine whether its axis of revolution coincides with the reflected optical axis of the telescope. For this purpose a very simple collimator is provided, and adjustments are made by slightly altering the position of the field mirror by regulating screws. The adjustment to avoid collimation error is the only one which is necessary, and it rarely needs to be verified, as the instrument is very rigid.

The box sextant contains two mirrors. One, called the horizon glass, is fixed at angle of  $45^\circ$  to the line of sight (as reflected by the field mirror), and the other, called the index glass, is opposite to it, and movable about an axis parallel to the plane of the horizon glass. An index is attached to the movable mirror, and a small scale, reading by estimation to degrees, is provided, so that the deviation of a ray of light reflected at both index and horizon mirrors may be known roughly to within a degree or two.

When the finder is directed towards a star, a ray from the star passes through the box sextant to the field mirror, and thence to the eye, without meeting and being reflected by the sextant mirrors. At the same time rays from the moon are reflected into the telescope from the index, horizon, and field mirrors (in that order), provided that the inclination of the index glass, as shown by its scale, corresponds to the angular distance of the moon from the star, and that the box sextant is suitably rotated about its own axis. As its axis coincides with the path of the star's ray, the necessary rotation can be performed without disturbing the pointing at the star. To avoid irradiation the two sextant mirrors are not silvered, and the brightness of the moon as seen through the telescope is about that of a sixth magnitude star; tinted shades are therefore unnecessary.

For an observation, the index glass is clamped, and the moon is allowed to make its own apparent contact between its limb and the star by means of its own motion relative to the star. While waiting for a contact, the motion of the star in altitude and azimuth is easily followed by rotation of the telescope in the two degrees of freedom permitted by its mounting, as already explained. A contact is obtained for each of three different distances, not by moving the index glass as in a sextant, but by deviating the path of the rays of light by means of a prism, which is placed in a slide between the horizon and index glasses. The prism has two faces nearly parallel, so that the refracting angle contained by them is very small. According as the prism is placed with the refracting angle vertical to the right, or horizontal in a middle position, or vertical to the left, so respectively will the image of the moon be deviated to a greater distance, or to (within the second order of small quantities) practically the same distance, or at a less distance, from the star than if the prism were not interposed at all. Hence the lunar distance at which contact occurs can be made to increase or diminish through three values not differing much from one another by altering the position of the prism in a manner which is perfectly definite, and which involves no ambiguity.

Two stars are selected near the ecliptic, one on each side of the moon (i.e. preceding and following it), and nearly equidistant from it. The exact local time having been noted at which one star is at a certain definite but not measured apparent lunar distance, the time at which the second star is at the same apparent



lunar distance is found. The method may therefore be called the method of lunar equidistances, though the equidistances are not simultaneous. A programme of suitable stars must be prepared, and this can be done very easily with no more labour than is necessary for predicting the circumstances of an occultation.

The process of observation consists in clamping the index mirror at the angle for the roughly estimated lunar distance; the instrument is then pointed at the first star, and the three times of the three contacts between the star and the moon's limb are taken, and the mean of these times is adopted; the instrument is then rotated and pointed at the second star, and the mean of the times of the three contacts is similarly found.

The computation consists in assuming a value for the longitude, and thence calculating the apparent lunar distances of the two stars for the local times at which they were respectively observed. The two distances as observed are exactly equal, hence if there is a difference between the two calculated distances the discrepancy must be due to an error in the assumed longitude. Half the amount of the discrepancy applied to each of the calculated lunar distances would make them equal, hence the correction to be applied to the assumed longitude is that corresponding to half the difference between the calculated distances. If the stars are favourably placed (*i.e.* not far from the ecliptic), and if the assumed longitude is not much in error (*i.e.* if the half difference is small), it is sufficiently accurate to assume that the rate the moon moves relative to the stars is 1 second of arc in two seconds of time, and hence the correction to be applied to the assumed longitude is two seconds (or 30'' of arc) for every 1 second of time of arc of the half difference between the calculated lunar distances, which is delightfully simple. If the assumed longitude were much in error, it would be necessary to find and use a more exact value for the rate of the moon's motion, or, which would be easier, to obtain a first approximation by a rough provisional computation, and then repeat the work with that approximate longitude to get the final correction. For the former of these two alternatives a graphic method might be devised.

The details of the computation are very similar to those for the determination of longitude by the method of occultations. The geocentric right ascensions and declinations of the moon and stars are taken from the 'Nautical Almanac,' and the corrections in right ascension and declination for parallax and refraction are calculated and applied. Here it may be noted that Mr. Wade gives a very neat and simple method by which these corrections may be obtained graphically. From the corrected quantities the apparent lunar distances are immediately obtained. The moon's corrected semi-diameter is found as usual, and is added or subtracted as necessary to obtain the calculated values of the two distances which by observation are equal.

The whole method compares most favourably with that of occultations. The instrument consists chiefly of telescope, and is quite as portable as the telescope required for observing an occultation, for which purpose it can be used if necessary. Any number of observations can be made any night that the moon is visible, instead of the small number on the comparatively rare occasions to which the occultation method is limited. The preparation of a programme is not more difficult than the prediction of the circumstances of an occultation. And, finally, the computations of the two methods are strictly analogous.

As regards the accuracy of the method, the frequency with which observations can be made has rendered it easy to discuss sources of error and to estimate the probable degree of approximation obtainable. The gravest source of error appears to be the acknowledged inaccuracy of the ephemeris positions of the moon; the astronomer royal kindly furnished the amounts of the errors in R.A. (averaging

7" or 8" of arc) observed at Greenwich during the time in which Mr. Wade's test observations were being made; the amount of the error is to be deducted from the difference between the calculated lunar distances before the longitude correction is deduced therefrom. So, too, must be deducted a correction for personal equation or systematic error, which can be found by taking observations in a place whose longitude may be assumed to be correctly known. It is one of the advantages that this method possesses over that of occultations, that personal equation can be easily determined, and still more easily applied.

Ephemeris errors and systematic or personal equation having been allowed for, Mr. Wade, in a severe discussion of his method, estimates that, apart from errors in determining local time, which of course are common to all methods, there is a probable error of 1.5 seconds of time ( $22''\cdot5$ ) in the longitude of a place as determined by a single pair of lunar equidistances. By increasing the number of observations this figure can be much reduced. In 'Hints to Travellers' the probable errors quoted for different methods are: for the determination of difference of longitude by the transport of five half-chronometer watches, a quarter of a mile; and for absolute longitude by an occultation of a star (one observation, which is all that is in general available, and even that seldom),  $\frac{1}{2}$  to  $1\frac{1}{2}$  mile. Mr. Wade's method therefore promises to prove a most valuable addition to our means of determining longitudes, and it deserves to be brought to the notice of competent observers, and to receive their careful consideration.

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### ADMIRALTY SURVEYS DURING THE YEAR 1907.\*

UNDER the orders of the Lords Commissioners of the Admiralty, eight of His Majesty's vessels, with three small hired vessels, manned by 87 officers and 794 men, have been employed on hydrographical surveys both at home and abroad.

The Marine Survey of India, in charge of an officer of the Royal Indian Marine, has been continued, as in previous years.

A detailed report of Admiralty Surveys has been drawn up and presented to Parliament. The following is a brief summary:—

During the year 1907, no fewer than 508 rocks and shoals dangerous to navigation have been discovered, and their positions fixed. During the same period 656 miles of coast-line have been charted; and an area of 4436 square miles has been sounded over by H.M. surveying vessels.

On the *South Coast of England*, re-examination was made at places within the harbours of Portsmouth and Plymouth, and their approaches.

In the *English Channel*, attempts were made to register the amount of rise and fall of the tide in deep water, at various positions. Sounding operations, also, were made off Start point, and westward of the Scilly islands, on account of reported shoal soundings; but in each case the charted depths were corroborated.

On the *East Coast of England*, re-examination was made of some of the channels at the mouth of the Thames, and north of the Goodwin sands.

On the *Coast of Scotland*, in the Isle of Skye, the chart of the entrance to Loch Ewe was completed, and that of the entrance to Loch Broom begun. In the Orkney islands, the passages between Mainland, Burray, and South Ronaldsay islands were surveyed, together with the waters surrounding the northern half of the latter island. In the island of Mull, the re-survey of the Sound of Mull was completed, as well as that of Loch na Keal.

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\* Kindly supplied by the Hydrographer.

On the *Coast of Ireland*, a re-survey of the Skerries (County Dublin), and of the entrance to Lough Carlingford, was carried out; as well as a new survey of Ballygerry bay and Rosslare harbour (County Wexford), including Greenore point and the banks to seaward.

The surveying ships in home waters have also carried out magnetic observations, both ashore and afloat, for Declination, Horizontal force, and Dip, at several places in the above localities. All surveying operations round the British isles were greatly impeded by bad weather.

On the *Coast of Newfoundland*, the survey of St. Margaret's bay was completed, together with the waters surrounding New Férole point; and a large area northward of the Fogo islands.

On the *West Coast of Africa*, Cestos bay, on the Liberian coast, was surveyed.

On the *Coast of British Columbia*, northward of the Queen Charlotte islands, a large area of Dixon entrance, leading to Port Simpson, was surveyed; together with plans of Masset harbour, Virago sound, with Naden harbour, and Parry passage; all in Graham island, the northernmost of the Queen Charlotte group.

In the *Red Sea*, a survey was made of the locality and approaches to the petroleum wells of Gimsah; and, further south, of the approaches to Mahomet Ghul.

Extensive sounding was done off the *Southern Coast of Socotra*, in search for a reported rock; and Aden was connected with Cape Guardafui by meridian distance.

On the *Coast of Ceylon*, the coast survey was continued from Barbelyn light-house to the southward and south-eastward, beyond Galle harbour; including large-scale plans of the latter port and its approaches. The coast outside Trincomali harbour was also surveyed.

The *approaches to Penang* have been re-sounded; and on the *Coast of British North Borneo*, a chart of Maruda bay nearly completed.

On the *Eastern Coast of Australia*, the approaches to Cairns harbour (Queensland) have been surveyed, and carried out to the 100-fathom line.

On the *Coast of China*, a survey completed of Challum bay; and of a large area between the mainland, and the outlying islets known as The Brothers and Lamock islands; also of Bias bay, and of the southern entrance to Mirs bay.

The Marine Survey of India for 1907 includes the completion of the eastern archipelago of the Andaman islands; a portion of the Arrakan coast of Burma, including Andrew bay; and a strip of the western coast of India, immediately southward of Bombay.

During the year the Hydrographic department has published 87 new charts; and 35 plates have been improved by the addition of 62 new plans; while 509 plates have received large corrections and additions; to the number of 8250.

The number of charts printed for the Government and the general public during the year amounted to 486,392; while 1922 Notices to Mariners have been issued.

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## REVIEWS.

### EUROPE.

#### ENGLISH COUNTY BIBLIOGRAPHIES.

'Hertfordshire Maps. A Descriptive Catalogue of the Maps of the County, 1579-1900.' By Herbert George Fordham. Pp. xii., 182. 19 *Illustrations*. Hertford: Stephen Austin & Sons. 1907. 4s. 50 copies *privately printed*.

In 1901, Mr. Herbert George Fordham, of Odsey, the present chairman of the Cambridgeshire County Council, began to publish in the *Transactions* of the Hert-

fordshire Natural History Society and Field Club, a descriptive catalogue of all maps of Hertfordshire from 1579 to 1900, which were to be found in public or in private libraries. So far as Hertfordshire is concerned, the requirements of the King's printer of 1626 have been amply satisfied, and the way is now clear for any other geographical enthusiast to make a similar list for any other county, English, Scottish, Irish, or Welsh.

Mr. Fordham gives bibliographical and biographical notes to each map entered, and there are copious indexes, giving the chief works of reference, an alphabetical list of titles of all atlases and maps, and of the names of all authors, engravers, and publishers. For a similar undertaking in English, we must go back as far as the year 1780, to Richard Gough's 'British Topography,' issued in two volumes, an excellent work, and the mainstay of every geographical curator. In France and Germany we find eminent geographical bibliographers, but nothing quite to equal the achievements of Mr. Fordham in a difficult and untrodden field. Geographical bibliography is, unfortunately, in England neglected by the Bibliographical Society, and there is no provision by the State for the uniform publication of classified bibliographies of maps. In America, when any political question arises, the Library of Congress publishes a special catalogue of maps in their map collection, and of books in their library.

In England, vast as the Empire is to-day, there exists no staff, nor any funds for this purpose, even at the British Museum, which, beyond question, contains the largest and the finest collection of atlases and maps in the whole world. The 'British Museum Catalogue of Printed Maps' was printed in 1885, a quarter of a century ago, but is sadly incomplete, and at times inaccurate. A second edition, recording the title, engraver, scale size, and publisher of each atlas and map, would be of the highest value to every library and geographical student throughout the civilized world. The 'Museum Catalogue of Manuscript Maps' has not advanced beyond volume 3, published in 1861, nearly half a century ago, and there is no alphabetical record of the manuscript maps acquired between 1861 and 1907, and there is actually no index of draughtsmen, artists, or places to volumes 1-3 (1844 to 1861). The Museum Catalogue of the maps, plans, and views which have strayed to the Department of Prints is not yet published, but, in any case, the collecting of printed maps by two departments of a national museum must be very costly to the poor tax-payer.

The British Museum will next year celebrate the 150th anniversary of its foundation. A printed catalogue of all its cartographical treasures would form a fitting memorial of an historical event which has conferred upon its promoters a claim to a more lasting and peaceful fame than they ever anticipated in those times of almost universal war, when the heroic struggles of General Wolfe had not yet culminated in the final glory of the heights of Abraham.

It is to be hoped that the success of Mr. Fordham in the almost untrodden paths of county bibliography will lead others to follow in his footsteps, and we shall look forward with equal pleasure, and we hope profit, to his exhaustive work on the maps of the county over whose council he so ably presides.

## ASIA.

### HIMALAYAN EXPLORATION.

'Ice-bound Heights of the Mustagh.' By Dr. and Mrs. Workman. London: A. Constable & Co. 1908. *Maps and Illustrations.* Price 10s. net.

On first opening this book the excellence and fulness of the illustration immediately strike the eye. The photographs, over 170 in number, and some of

them charmingly coloured, are not merely illustrative of the text, but have been taken by a photographer who knew how to choose his point of view, and how to select his subject. With hardly an exception they are sharp and clear, and the process work has likewise been admirably done. Not only is this true of the views of great mountains, but also of the little bits in the valleys, such as the admirable rose-tree among rocks on p. 11. In cases where figures are introduced, the moment chosen is when the grouping of them is either very fortunate (as in the glacier caravan, p. 97) or admirably arranged (as in the raft scene, p. 37).

The authors have now devoted five long seasons to the exploration of the mountains of the kingdom of Kashmir. Their work has been in a high degree laborious, and their accomplishment considerable. They have made detailed surveys of good quality of many parts of these most intricate ranges. They have repeatedly reached very high altitudes, and they have added largely to our knowledge of what is perhaps the most notable mountain region in the world. From time to time they have given account of their doings in papers read to our society, and published in the *Journal*, so that there is no occasion here to repeat in briefer form what has already been set forth at more length in these pages.\*

The present volume is devoted to the doings of two seasons, 1902 and 1903. In the former year they made the first thorough exploration of the recesses of the Chogo Lungma (glacier). In the latter they explored the interesting Hoh Lumba, and then returned to continue work on the Chogo Lungma. The important and interesting map which accompanies this volume is the best evidence of what they accomplished. It enables every step of their way to be followed as described in the text, and it transforms the queer-looking region of the old map into a consistent mountain and glacier system. In one corner of the map a curious "cornice glacier" is marked, apparently surrounded by cols and peaks, with no outlet anywhere. This is of course impossible. The glacier is a tributary of the Biafo, as no doubt it is intended to appear, and its hollow is in fact the real continuation of the depression in which the Biafo lies, the great gap east of it, through which Snow lake drains, having been broken down in the process of time by an overflow from that great ice-reservoir, which formerly discharged itself down the Hispar glacier. The west ridge of the Kailasa peak is easily seen from all the upper part of the Hispar glacier to be a continuation of the ridge that looks down upon that glacier's south bank. Lovers of mountain literature will find plenty to interest them in the text of this carefully prepared volume.

MARTIN CONWAY.

## AFRICA.

### THE EASTERN DESERT OF EGYPT.

'A Preliminary Report on the Geology of the Eastern Desert of Egypt between Lat. 22° N. and 25° N.' By W. F. Hume. Survey Department, Cairo. Paper No. 1. 1907. 72 pp., 5 pl., 4 maps. Price 150 millimes.

The recent resumption of mining in the Nubian desert has aroused fresh interest in the geological structure and geography of the region lying to the south-east of Egypt between the Nile and the Red sea, and we owe to Dr. W. F. Hume, of the Geological Survey of Egypt, an important contribution to the knowledge of that area. The result of his surveys are now issued on two topographical and two geological maps on the scale of 1 to 500,000, a plate of sections showing the main features in the structure of the country, and a valuable preliminary report of seventy-two pages. The area described in the report includes the sites of some

\* *Journal*, vol. 25, p. 245; 27, p. 129; 31, p. 12.

prehistoric mining fields, where, according to Dr. Hume, the mining operations were exceptionally well conducted and very extensive. The archaeological evidence which Dr. Hume collected leads him to the view that the work is Egyptian, under some slight degree of Greek influence. The mines worked gold-quartz veins, which, as is the case in so many mining fields, occur where masses of diorite and syenite have been intruded into schists, but are absent or scarce where the intrusions are of an acid granitic rock. There are also ores of copper and hæmatite, and Dr. Hume has made the first discovery of chromite in this district.

Perhaps the most interesting of the mineral deposits are the emeralds. The general geological conditions of the emerald mines have been described in the paper by Dr. Donald A. MacAlister, "On the Emerald Mines of Northern Etbai," published in this *Journal* (vol. 16, 1900, pp. 537-549, map). According to Dr. Hume's description of the mode of occurrence of the emeralds, they appear to have been developed in the contact zone between gneiss and schists, and they are associated with rocks rich in tourmaline. One apparent difficulty in this explanation is the four-fold repetition of the emerald-bearing bed on the hillside at Sikait. This repetition, however, Dr. Hume attributes to the action of folds.

The geological structure of this country consists of a great platform of Archæan rocks, granites, diorites, syenites, and wide sheets of schists. The next important member is the Nubian sandstone, which is extensive in the western part of the area. The Nubian sandstone in this district is all allotted by Dr. Hume to the Cretaceous, and the survey has been fortunate in the discovery of fresh fossiliferous horizons in the formation. One very interesting addition to the history of the Nubian sandstone is the discovery of a volcanic series interbedded in the base of the formation. The volcanic rocks include basalts, rhyolites, andesites, and diabase. The Nubian sandstone is often bounded to the east by faulting against the Archæan series. In the north-western corner of the sheet near Luxor, Dr. Hume has mapped the most southern known outcrop of the Eocene limestones of Egypt.

The report includes an interesting chapter on the wells, and the amount of water available appears to be generally adequate for a small party of travellers, but the wells are often difficult to find. This preliminary account shows that this south-eastern desert of Egypt is of great geographical and geological interest, and we shall look forward to the promised fuller description of the district and of its ancient mines.

J. W. G.

#### FRENCH CENTRAL AFRICA.

'L'Afrique Centrale Française.' By Dr. Auguste Chevalier. Paris: A. Challamel. 1907. Pp. xviii. + 776. Price 20 fr.

As stated in the sub-title, this is the (somewhat belated) official report of the Shari-Chad Mission of 1902-04, which was conducted by Dr. Chevalier, and the main object of which was to inquire into the economic resources of the vast region lately acquired by France about the Congo-Chad water-parting. "French Central Africa," as this great divide is here called, had already been crossed and even partly surveyed by Crampel, Dybowski, Maistre, Gentil, and other pioneers, and a line of forts—Bangui, De Possel, Sibut, Crampel, Archambault—had been erected along the beaten track between the Ubanghi-Congo and the Shari-Chad basins, the object being to link up the French Sudanese and Congolese territories by the permanent occupation of the hitherto little-known intervening fluvial slopes. The political aims being thus effectively served, a free hand was given to the "Mission Chari-Lac Tchad" to devote all its energies to the scientific study

of the physiography, natural history, ethnology, and material resources of the whole land, with a view to its profitable exploitation. It is no exaggeration to say that this ambitious programme has been fully carried out, as may be at once seen by an inspection of the two large-scale maps which accompany the text, and present a picture of the geographical, racial, and economic relations in these Central African wilds such as could scarcely be supplied by many civilized or long-settled regions—Persia, for instance, or the Indo-Chinese borderlands, or large tracts in the Brazilian Amazonian provinces. It is the thorough treatment of details that imparts its special value to Dr. Chevalier's report, which embodies the main results of the work done by himself and his worthy associates in almost every branch of geographical knowledge; so that, after this rich harvest, nothing but gleanings will be left for future adventurers in vast savage lands discovered but yesterday.

Most valuable were the fruits gathered during the five months' stay at Ndellé, present capital of Mohammed Senussi, Sultan of Dar-Kuti. Ndellé occupies a commanding position about the triple Congo-Chad-Nile watershed, and from it Dr. Chevalier was able conveniently to visit several points of great geographical interest. Such especially was the great "Lake" Mamun, which turned out to be only an extensive marshy depression which lies on the main route between Ndellé and Darfur, and is no doubt flooded at high water, but is usually inhabited chiefly by the pestiferous tse-tse fly, whose range is now known to extend as far north as Waday. Another more substantial discovery was the real Lake Iro, which was already reported by Nachtigal, but wrongly stated by him to receive the Bahr Salamat from Wadai. The Salamat flows some miles south of the lake, and reaches the right bank of the Shari some distance below Fort Archambault. Later the mission visited Lake Chad and surveyed the south-eastern parts; but, strange to say, the results are not clearly shown on the maps of this elusive basin. Nor is the stretch of dry land indicated which is now known to divide it into two basins. Is this a tectonic division, or is it due to recent subsidence? Our author believes, with others, that Chad was formerly far more extensive than at present, and in prehistoric (Neolithic) times drained northwards to the Mediterranean. He also shows that the Bahr-el-Ghazal is, so to say, both an outlet and an inlet, at one time penetrating from the lake far to the north-east, whence it received contributions from the now arid eastern Sahara.

He has much to say about the above-mentioned Sultan or Emir Senussi, one of the few Central African potentates who still enjoy a measure of political autonomy. He is a member of the Baghirmi dynasty, who, after the overthrow of Rabah, established himself in the Dar-Kuta district, where it will be a surprise for many to hear that he still continues the slave-raiding practices of the Arabo-Nubian and Central Sudanese chiefs, and this under the very eyes of the French agent stationed at Ndellé. On this point, as well as on the many shortcomings of the French authorities in their New Central African dominion, M. Chevalier is very outspoken. Senussi's *razzias* have depopulated the Ndellé district to such an extent that he has now to extend the range of his slave-hunting expeditions as much as eight days round about in order to make the game worth the candle. The captives are grouped in two classes: one destined for domestic bondage, the other for the Wadai and other foreign markets, just as in the days of Barth and Nachtigal. "Maintenant," exclaims M. Chevalier, "c'est le vide (et quel vide!) dans tout le Dar-Banda, où, pour ses *razzias* annuelles, Senoussi est obligé d'envoyer dorénavant ses lieutenants à huit jours au moins de Ndellé; c'est la dépopulation chez les Saras, chez les Moroubas," etc.; and the French administrators themselves are warned that, unless they mend their ways, in half a century the natives will have

completely disappeared, and "c'est le désert qui prendra possession de l'Afrique centrale française."

A large part of the book is occupied with numerous appendixes, in which are tabulated and described the geological, mineralogical, zoological, and botanical specimens collected by the mission. There are also six maps, eight plates, and 112 illustrations, which, however, are not all worthy of French art.

A. H. KEANE.

#### SOUTH AFRICA.

'Südafrika: Eine Landes-, Volks- und Wirtschaftskunde.' By Prof. Dr. Siegfried Passarge. *With 47 Plates, 34 Charts, and numerous inset Illustrations.* Leipzig: 1908. Pp. xxv. + 355. Price 7.20m.

For this general survey of the southern section of the African continent a special value may be claimed, both on account of its comprehensive character, and more particularly because it is no ordinary library-chair compilation, but the outcome of serious studies made largely on the spot by a trained observer of acknowledged authority in most branches of the natural sciences. It is not addressed so much to specialists as to ordinary intelligent readers desirous of acquiring a competent knowledge of a land presenting an unusual number of problems interesting alike to the naturalist, the political economist, and the statesman. One of these problems turns on the long-standing difficulty of reconciling the geographical environment with the ethnic and social relations, a difficulty scarcely felt in small areas such as Iceland or Sicily, but almost insurmountable in wide continental domains. It is rather naïvely remarked that here we have to help ourselves as best we can, and the plan adopted by the author is first to discuss the general physical features of the land; then its climate, on which so largely depend the flora and fauna; and, lastly, the human elements, their culture, social and political status. If, with all this, Dr. Passarge does not quite succeed in establishing complete harmony between the various factors under consideration, he at least follows an excellent programme, which is here developed with exceptional skill and competency. A jarring note, however, is struck when he attempts a solution of the racial problem, which in the near future must become the most pressing of all.

Another problem, not of the future, but of the remote past, concerns the origin of the Zimbabwe monuments and associated gold-mines. This question is handled with the strictest impartiality, and, after duly weighing the arguments for Bent's and Maciver's views, Dr. Passarge winds up in favour of the former as much the more probable. He aptly remarks that, apart from all other considerations, the civilization represented by these remains is an intruder in South Africa. It is not native-born; "it comes from without, and it is most unlikely that it was developed from small beginnings in Africa itself."

Rather a novel feature are the numerous small-scale maps, which will be heartily welcomed by the geographical student, as greatly helping to understand the orographic, hydrographic, meteorological, and other physical conditions in this geologically ancient section of the continent. Thus there are charts clearly showing highlands, plateaux, terraced lands (karroos), and marine currents; divides, watersheds, and fluvial basins; isothermals and isobars, with their annual variations; summer and winter rainfall, and geological formations in connection with the characteristic transitions from the reptilian to mammal life in the Austral lands. All this makes it an ideal handbook for educational purposes, and from this point of view an English edition should command a wide circulation.

A. H. K.

## AMERICA.

## SOUTH AMERICAN RAINFALL.

'Die Niederschlagsverhältnisse von Sudamerika.' By Ernst Ludwig Voss. *With 19 Maps.* Ergänzungsheft No. 157 zu *Petermanns Mitteilungen*. Gotha: Justus Perthes. 1907. Price 6m.

The reader will share the regret of Herr Voss that he was unable to bring out the results of all his work on the climate of South America at the same time. Any treatment of the rainfall without simultaneous adequate consideration of the winds must lose much of the interest that the subject naturally possesses. The author, who held a meteorological post in the state of São Paulo, in Brazil, has collected a mass of statistics from different parts of the continent, which he has arranged in a convenient form for reference, and illustrated by a large series of maps. Unfortunately, the value of the latter is largely discounted by the absence of reliable information from many important areas. This is the more to be regretted because the meteorology of South America presents many distinctive features that deserve the most careful study.

The author recognizes that a large proportion of atmospheric moisture of the Amazon basin is derived from the evaporation from the rivers and streams and forest foliage, but does not refer to the fact that much of the area outside the streams is under water for a considerable portion of the year, especially in the west. The truth is that, for all practical purposes, the Amazon basin and some adjoining tracts play exactly the same part as an inland sea more than twice the area, as the author notes, of the Mediterranean. And this fact has some important consequences to which he does not draw attention. North of 20° south the Andes are in practically the same position as if they had the ocean on both sides, and there is only the local influence of their land-masses to interfere with the normal ocean distribution of winds. The result is that in the region of the south-east trades a very heavy rainfall occurs on the more eastern ranges of the Andes, the annual total being in many cases over 80 inches. Though naturally greatest in the summer months, it is by no means confined to them, and in many localities heavy rain occurs whenever the pressure is higher than usual and a strong wind blows from the southward. In the author's maps a continuous increase is shown from the rainless region in the west to the centre of the Amazon basin. There is no indication of a maximum in the eastern ranges of the Andes. Yet this tract of abnormally heavy rain is of the greatest importance, for it contributes an enormous volume of water to the western portion of the Amazon basin, and the inundations to which allusion has already been made. There is, in fact, a local circulation of water between the Andes and the plains to the eastward, which is of considerable interest.

The ocean character of the Amazon basin is also responsible for the rainless Pacific shore. The south-eastern winds are deprived of their moisture by the Andes, and there is no heated central area, even in summer, to reverse the air currents and bring in monsoon winds from the westward. Herr Voss attributes the want of rain to the low temperature of the sea-water drawn up from the ocean depths to supply the westerly currents, and this may explain why the west winds which blow intermittently in the immediate neighbourhood of the shore-line bring no rain to the coast, but it is insufficient alone to account for the deficiency of precipitation. There is a similar occurrence of cold sea-water on the west coast of Africa, but there the heating of the Sahara during the summer months causes an inflow of air from the Atlantic, and thus ensures an ample rainfall to the coast.

There is reason to believe that there has been a progressive desiccation of the Sahara since late Tertiary times. If this be so, it must have been accompanied by a corresponding increase in the rainfall on the sea-border. If the Amazon basin were upraised 1000 feet, a gradual transition to less humid conditions would result in an amelioration of climate to the west of the mountains. Such a transformation would appear to be in progress further to the southward.

It is not correct to say that when rain does occur on the rainless strip on the west coast, it is always in the form of torrential precipitation. The mist-like garua of Lima and the adjoining coast is exactly contrary in character.

Perhaps the most interesting features brought out by the maps is the persistence of the area of deficient rainfall on the borders of Ceará and Bahia, due to the surrounding mountains, and the small region of rainfall that maintains itself to the west of the lower Paraguay throughout the greater part of the year. By an unfortunate error, "16" has been printed "61" in each of the four seasonal maps; "O" for "W" on p. 10, line 18, of the text. One would wish, too, that the almost absolutely rainless strip of Peru and North Chile had not been coloured as a region of "excessive winter rain."

Meteorologists will look forward with interest to the early publication of the remainder of the author's work on the weather of South America.

J. W. E.

#### AUSTRALASIA AND PACIFIC ISLANDS.

##### THE WESTERN PACIFIC.

'Dreissig Jahre in der Südsee.' Land und Leute, Sitten und Gebräuche im Bismarck-archipel und auf den deutschen Salomoinseeln, von R. Parkinson. Herausgegeben von Dr. B. Ankermann, Direktorial-Assistent am Königlichen Museum für Völkerkunde zu Berlin. Mit 56 Tafeln, 4 Karten und 141 Textabbildungen. Stuttgart: Strecker & Schröder. 1907. Price 10m.

This volume represents a gathering together of the vast amount of material which Herr R. Parkinson, who has lived in the islands of the South seas since 1875, and has been resident in the Gazelle peninsula, Bismarck archipelago, since 1882, has had unique opportunities for collecting. The importance of his work in the recording of vanishing data is shown by his statement in the preface that the natives even now bring their sons to see his collection of weapons and implements, to point out to them the objects used by their forefathers; and he alleges that twenty-five years hence the astonished Bismarck islanders will gaze at the weapons of their ancestors, stored in European museums, with the same wonder as is aroused in us by the sight of the implements of our Stone Age predecessors.

The first chapter deals with Neu Pommern (New Britain) and the French islands, and Herr Parkinson deplores, at the outset, "the leidige Frage" of geographical nomenclature, with regard to which this region has been peculiarly unfortunate. Native names, which he invariably prefers, seem almost unattainable, and where they occur they are frequently—as in the case of Amakata and Tombara—erroneously applied. Main features, such as large islands or mountain ranges, rarely have any native names, and the local names for each separate promontory or peak differ according to the people using them.

Different sections deal with Neu Mecklenburg (New Ireland), St. Matthias, the Admiralty islands, the Western islands (Ninigo group), the German Solomon islands, together with Nissan and Carteret islands, and the Eastern islands (Nuguria, Tauu, and Nukumann). In each section a description is first given of the geographical features, illustrated by very numerous and excellent photographs mostly taken by the author, followed by an account of the people, their houses,

clothes, ornaments, and implements, etc.; and separate chapters are devoted to sociology (secret societies, totemism, masks and mask dances), legends, and tales, language, flora, and fauna. The final section gives the history of the discovery of the islands, with reproductions of early maps, from those of de Bry (1596) and Witfliet (1597) onwards. Even this excellent monograph is full, as the author himself laments, of gaps and queries. Even now in New Britain and New Ireland there are peoples of whose language not a single word is known, and who have never yet come in contact with white civilization.

The following is the author's view with regard to the racial affinities of the people he deals with. He quotes Dr. Hagen's opinion, that the type of the Bismarck archipelago is a distant type belonging to the Austral-Papuan area, which has developed there, and is nearly related to the Australian type, these two types together forming a secondary main variety of the human species. We know that the aboriginal Tasmanians showed affinities with the New Britain type; they had frizzly hair, while that of the Australians is curly or wavy. If we look at Alfred Wallace's map of Australia in 'Island Life,' there is no difficulty in explaining this similarity. At the beginning of the Tertiary period, the continent consisted of two main portions, western and eastern, separated by a broad arm of the sea. "It is noteworthy that at the present time Eastern Australia is inhabited by a frizzly-haired people, who, if not identical, are nearly allied to those of New Guinea and to Bismarck archipelago. [This statement is not true.] The people of Western Australia belonged to a different race, more probably nearly allied to the 'Alfuren.' [The Alfurus are not now recognized as a race. Dr. F. Sarasin, in his 'Versuch einer Anthropologie der Insel Celebes, Zweiter Teil' (1906), does not make use of this term, but he describes the Tóala of Celebes, whom he regards as related to the Veddah and Senoi (Sakai); it is from this stock that the Dravidians have probably diverged on the one hand, and the Australians on the other.] At a later period, when the two parts of the continent were joined, the two groups mixed, and the western Australians overran the eastern portion, mixing with, destroying, and assimilating the inhabitants. In the south, the Tasmanians were untouched by this invasion, and later they were further protected by the formation of Bass's strait." Parkinson thus makes Australia inhabited by man in the Tertiary period! But perhaps it is not fair to take his theory too seriously. Prof. Gregory is of opinion that man penetrated into Victoria only some three hundred years ago.

The work is so full of careful, first-hand information of great value, that one would like the last word of this notice to be one of praise rather than of criticism.

A. C. H.

#### AUSTRALIA AND NEW ZEALAND.

'Stanford's Compendium of Geography and Travel.' (New issue.) Australasia. Vol. 1. 'Australia and New Zealand.' By J. W. Gregory. Second edition, re-written. London: Stanford. 1907. *Maps and Illustrations.* Price 15s.

The previous edition of this work was written in 1893 by A. R. Wallace. The old work contained 14 maps and 69 illustrations, and the new work contains 33 maps and 80 illustrations. There are 15 chapters and 505 pages in the old book, and there are 17 chapters and 657 pages in the new book.

It may be pointed out that the geological and ethnological chapters had to be re-written. It is unnecessary to say that Prof. Gregory's geological chapters are minute, laborious, and ingenious; that geology holds the key to physical geography; and that physical geography is the chief thing with which geographical students have to do. Prof. Gregory's characterizations of the "Great Dividing range" of eastern Australia as "highlands" and "dissected plateaus," and of Lake

Keilambelt and its fellows as "volcanic caldrons" are admirable. Geology also throws the only light on subterranean geography, and Prof. Gregory's indictment of the view that artesian water is practically inexhaustible is already familiar to readers of his 'Dead Heart of Australia,' and is elaborated with further and more cogent details. His appreciation of the subtle Archæan and Lower Palæozoic mountain lines, which run from west to east across South Australia, shows originality and insight. Students are often puzzled by the different nomenclatures adopted by the geologists of the different states, and Prof. Gregory is attempting, probably for the first time, to grapple with the difficult task of reconciling systems which differ more in name than in essence; and we agree with his wise doubts as to the occurrence of "Glossopteris" in Queensland sandstone, and with his convincing arguments that dingoes existed before man existed in Australia, although these are matters which have given rise to considerable controversies. He believes, and we think rightly, that the Australian aborigines are a pure race, and his chapters on Australian and Tasmanian aborigines combine mature knowledge with a sound judgment, which is independent of the authorities from which his knowledge is derived. The rest of the animal kingdom as it exists in Australia is adequately described, new light being thrown on Pelorus Jack; and the vegetable kingdom is fairly described, although some references, for instance to those ambiguous vegetables, the Australian "spinifex" and "tea tree," and to the so-called "tropical character" (p. 300) of north-eastern New South Wales, surely require further explanation. Prof. Gregory states that "the first settlements were on the coast at Botany Bay and in Port Jackson" (p. 276), and that "no other expedition" after 1870, "dependent on horse transport, has ever again crossed Australia from west to east" (p. 75), and he writes of the abandonment of the early settlement at Gladstone as though Gladstone were in the northern territory of South Australia, quoting as his authority "Hogan, J. P., 'The Gladstone Colony: an Unwritten Chapter of Australian History' (London, 1898), pp. vi. and 278." These three statements are elementary errors. There never was a settlement at Botany Bay. Sir J. Forrester's famous traverse from west to east in 1874 depended on horse transport solely and exclusively; and the early settlement at Gladstone was on the east coast of Queensland, 1000 miles away from the coast of northern territory, as any one of the 284 pages of Mr. Hogan's book would have informed Prof. Gregory. But the work is primarily a work, not of geology or history or biology, but, like its predecessor, of geography, and it is by its geographical merits or demerits that it must stand or fall.

There are a few small points to which attention might be called. Of New South Wales he writes that "the State is divided into thirteen districts" (p. 320), but does not enumerate them. Turning to the old book, we read (p. 241) of thirteen pastoral districts outside the original twenty counties of New South Wales. Prof. Gregory has apparently mistaken a former subdivision of the unsettled parts of New South Wales for a present subdivision of the whole of New South Wales. Again, is Arnhem Land, in northern territory, 4000 feet high? (p. 98). Has Perth 83 inches of rain? (p. 193). Is Mount Torlesse east of Christchurch? (p. 597). Is Dunolly in the southern end or, as his map suggests, on the east of the Pyrenees? (p. 444). Or are these statements misprints? Again, he writes of Australia that its "political divisions are separated by well-marked natural boundaries" (p. 84). Apart from the oddity of including lines of latitude and longitude under the expression "natural boundaries," the reader may well ask, how about the north boundary of the political division called Queensland? This boundary, it will be remembered, is so drawn as to include some 60 miles north of the Australian continent, and within 1 or 2 miles of

New Guinea. The only answer is found on p. 348, where the southern, western, and eastern boundaries of Queensland are defined; but no northern boundary is even referred to. Wallace's book contained useful lists of provinces, counties, towns, and the like. Prof. Gregory's book alludes to some of the provinces of New Zealand, without explaining what the allusion means; omits the lists of counties—the omission is more or less justifiable—and in abbreviating the lists of towns excludes Grafton in New South Wales, while it includes Wingen in the same State, which has "one store and two wine-shops," according to Gordon and Gotch; and includes Ashhurst (New Zealand), whose population is stated at 300, while it excludes the former capitals of the provinces of Marlborough and Westland. His selections from the old list are capricious, and do not always ensure the survival of the fittest. Nomenclature and the spelling of names are very small matters, and there is much variety of usage in these matters among writers of acknowledged authority. Western Australia, which was called West Australia in the recent edition of the 'Encyclopædia Britannica,' is now represented by its nickname Westralia. This, though undignified, may pass, for we know what is meant; but surely it is most perplexing to spell less familiar names differently on different pages. Thus Condobolla and Condoublin (Condobolin?), Cudgewa and Cudgewong, Yingellee and Yingellie, Yunees and Jewnee, Raukumara, Raukamara, and Raukaumara, Woolamai and Wollamai, are distracting instances of carelessness. In spite of these small shortcomings the book deserves to be regarded as the standard work on Australian geography, of which the author is an original and at the same time a safe and trustworthy exponent. He grasps the whole subject with a masterly hand.

J. D. R.

## POLAR REGIONS.

### ARCTIC RESEARCHES.

'The Ziegler Polar Expedition, 1903-1905, Anthony Fiala, Commander. Scientific Results obtained under the direction of William J. Peters, representative of the National Geographic Society in charge of Scientific Work.' Edited by John A. Fleming. Published under the auspices of the National Geographic Society by the estate of William Ziegler. Washington, D.C.: 1907. Pp. 630.

The observations recorded here include magnetic observations, notes and sketches of the Aurora Borealis, and meteorological and astronomical and tidal records. Owing to the loss of the ship, much time was occupied in erecting winter quarters, in transporting coal and provisions, etc., and many lines of research had to be abandoned for want of sufficient observers and of complete instrumental outfits. For the latter reason, no records are given of relative humidity, vapour pressure, or dew point. Meteorological and tidal observations were taken at Teplitz bay, Rudolf island, and at Cape Flora; magnetic at Teplitz bay and Alger island. The tide appears to reach Franz Josef Land by two channels—one between Norway and Spitsbergen, and the other between Spitsbergen and Greenland, the tide-wave through the latter reaching the northern part of the group four hours before the southern wave reaches Cape Flora. No discoveries were made in the flora of the islands. Ptarmigan were seen for the first time, and several were shot at Teplitz bay, on Alger island, and Rubini rock. The pair collected on Alger island were the Spitsbergen ptarmigan (*Lagopus hyperboreus*), and probably were blown over from that island. Maps compiled from the observations of the expedition, and from those of former explorers, accompany the report. De Long fiord was found to be only a bay; Booth, Rhodes, and Brown fjords are channels dividing Payer's Zichy Land into separate islands; and Richthofen peak is situated on Alger island. Measurements of a glacier to the

south of Rubini rock, Hooker island, are interesting as the only definite information on ice-movement in the archipelago. The foot of the glacier was advancing into the bay at the rate of about a foot a day. As the season was midsummer, with temperatures of 32° to 42° Fahr., the movement was probably at its maximum.

## GENERAL.

### SOME REMOTE ISLANDS.

'Three Voyages of a Naturalist.' By M. I. Nicoll. With an Introduction by the Right Hon. the Earl of Crawford. London: Witherby & Co. 1908. *Price 7s. 6d. net.*

The author gives some account of three voyages on the R.Y.S. *Valhalla*, during which he visited such interesting and little-known islands as St. Paul's rocks, Fernando de Noronha, South Trinidad, Tristan da Cunha—all in the Atlantic ocean—Gloriosa, Assumption, and Aldabra in the Indian, and Easter and Pitcairn islands in the South Pacific.

For the most part the book consists of a record of the birds which the author sees and shoots, with scanty notes and observations on their nesting and habits. Of the islands visited there is no attempt to give an account from any aspect except that of birds, while the latter are recorded as seen or shot for each island by itself without any consideration of how they got there, or why they have continued to exist there, or of their particular relationship to their environment. The best account is of South Trinidad, on which the dead trunks of a forest of trees, apparently "acacia," were found, often making progression difficult. They appear to have been almost killed out in recent years, being replaced in parts by a jungle of tree ferns. Aldabra is another island of great interest for its indigenous birds and land tortoises, but our author's time there was curtailed by difficulty in getting ashore at low tide and by rain. Incidentally its lagoon is stated to be 30 miles across, while the maximum length of the island is 19 miles on the Admiralty chart, a sample of a very conspicuous lack of accuracy throughout the whole book.

Mr. Nicoll appears to us to be an excellent collector of birds, though his book shows a lack of that geographical feeling which one almost demands of an author-voyager to such interesting lands.

## SHORT NOTICES.

*Europe.*—'Fynes Moryson's Itinerary.' (Glasgow: Maclehose. 1907. Four vols., pp. xv., 466; vii., 466; vii., 499; ix., 521. *Maps and Illustr.* 50s.) Like other issues from the same house, this is a simple and excellent reprint. Save for a brief publisher's note, including a biography of Moryson, the edition is without commentary; only trivial textual alterations (such as the correction of printers' errors) have been made, together with references to the pages of the original edition. An index, however, has been supplied; this is well; for it was a necessity which the original did not supply; the place-names quoted in it are not always (though generally) spelled conformably to modern usage. Some of the old maps (for example, the perspective of the "cittie of Limerick") are highly interesting.

*Asia.*—'Ceylon, the Paradise of Adam.' By Caroline Corner. (London: John Lane. 1908. Pp. xiv., 324. *Illustr.* 10s. 6d. net.) This is a purely personal "record of seven years' residence" in Ceylon. It is, in some degree, distinguished among similar works by the sinking of the writer's individuality in the use of the third person, and in the large amount of conversation quoted—principally between the heroine (if the term may be used) and servants, and other natives, which adds to the interest by demonstrating their character. Many scenes and incidents, picturesque or exciting, are vividly described.

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## THE MONTHLY RECORD.

### EUROPE.

The Forest Populations of Central France, in Morvand, Bas Nivernais, and Puisaye, are the subject of a recent monograph, forming one of the series entitled 'La Science Sociale,' and edited by M. E. Demolins. Morvand is an isolated massif 55 miles long and 25 wide. It lies in the zone of humidity which is characterized by great forests of oak, beech, and elm. The soil is granitic, and cultivation is carried on only in a few favoured spots. The watercourses which flow from the plateau bear large quantities of floating timber to Paris. This is used for fuel only, and the industry is only in the elementary stage, while changes in methods of heating have caused depression. On this account the people are forced to emigrate to Paris and the large towns, the men obtaining work as harvesters and carters, the women as nurses. It is pointed out that the old system of family life was well adapted to this region when the inhabitants lived directly on the products of an extensive cultivation supported by pastoral activity. It declined when the cultivation became more intensive and allowed the sale of excess products. It disappeared when production was completely commercialized, and forced the population to procure its sustenance from outside. The next area, Bas Nivernais, is a limestone plateau, dissected and broken. Le Bazois is a typical district of meadows and woodland, in which cattle rearing and forestry are the principal occupations. Cultivation is carried on on a large scale, and the metayage system has disappeared. Deposits of iron, lead, and oil are worked industrially, the workmen forming close corporations in which the son takes the place of the father. Kaolin is found, and gives rise to an earthenware industry at Nevers. The introduction of machinery has increased profits, wages, and production, but also antagonism between master and workman, and social disorder. Increased use of iron in building construction, change in fuel, and foreign competition have depressed the timber trade. The woodcutters have formed associations, but industrial development has disintegrated the family. With the development of communications La Puisaye has improved its silicious and clayey soil by lime, marl, and chemical manures. Intensive cultivation is carried on in "artificial" fields, wheat being the chief cereal. Iron and earthenware industries have languished, while the forests are further being exploited for building purposes. Luxury and factitious needs are sapping the energy of the people and diminishing the birth-rate. The men emigrate to Paris to find service under the State, while the women obtain employment as nurses.

The Geographical Element in the Roman Road System is elucidated in an article, illustrated by a map of the Roman roads in Austria, by Prof. O. Jauker, of Laibach, in the *Geographischer Anzeiger* (vol. 9, No. 4). The practical science with which the Roman roads accommodated themselves to the geography of the lands they traversed may be inferred from the fact that the main highways of Europe still follow the Roman lines, and that where, for short distances, modern roads deviate from the Roman, it is in most cases not to their advantage. Though a scheme of the Roman roads is no longer producible in full, an idea of their range and ramification is suggested by the marvellous network recently discovered by Ballif in the most inhospitable part of Herzegovina, where the Roman tracks have not yet been obliterated by later culture. In the Roman roads may still be read the shifting of centres and lines of operation from the coast to the Save, and thence to the Alps and the Danube, while the records of the mile-stones enable us to ascertain whether at the respective dates Rome was in communication with Germany, the Alps, or

**Pannonia.** Chief among the geographical factors not influenced by, but powerfully influencing, Roman history is the great chain of the Alps, which opposed a formidable barrier to foreign invasions, and imposed a salutary check on rash extension of Roman dominion beyond them. To the west is a series of great mountain masses, penetrated by some deeply cut valleys or mountain passes over 6000 feet high. It was, however, very late before the Romans carved out roads along these lines. They preferred circumventing the Alps by following the Julian road along the sea-coast. To the east is a succession of chains lower and more practicable. Yet it was not till the tide of Roman conquest assailed Pannonia and Bohemia that the passage of the eastern Alps became of urgent importance. Tracing out the east Alpine and Karst roads, the author shows how far they were determined by the morphology of the respective regions. As an illustration of the excellence of the Roman alignment, the article gives lists of places united by roads radiating from Verona and Aquileia, and of places at the extremities united by peripheric roads.

**The Geography of the Sundgau.**—A sketch of the geography, physical and anthropological, of the Alsatian district known as the Sundgau, is given by Herr Tschaeche in the *Deutsche Rundschau* (vol. 30, No. 7). In historic times the name—a corruption probably of *Südgau* (south country), in contradistinction to *Nordgau*—covers very fluctuating areas of land, and seems still used with much laxity of application. Treating the Sundgau as a geographically distinct unity, viz. the pre-glacial depression uniting the upper Rhine trough with the Rhone depression, the article restricts the name to the undulating land stretching from the Jura to the Vosges and the Doller valley, bounded on the west by the frontier line, and falling off eastwards rather steeply to the Rhine plain. At its northern edge the land rises to about 900 feet; in the south to over 1400 feet. Sloping from east to west, its greatest elevation on the east is not very considerable. The valley formation is peculiar. The Ill, Larg, and Hundsbach creep along listlessly in valleys of a breadth such as, in their present scanty condition, the rivulets could never have scooped out for themselves. Spacious dry valleys, in which young valley formations lie embedded, are a feature of the Sundgau, and their formation is traced to the waters of the ice-age. Everywhere abundantly watered, the Sundgau is adorned with numerous lakes laid out "like strings of pearls." The climate is highly favourable, and flora and fauna are of great range and many species. Fruit is so plentiful as to be largely distilled into spirits. The luxuriant meadows yield excellent fodder for cattle, which are raised in great numbers. There is abundance of limestone, clay, marl, and sand, but practically no minerals of economic value. In every larger village there is a small brickfield. Recently great cotton-spinning and weaving factories have been erected, and the large farmers (mostly Anabaptists) have had to bring Polacks as field labourers from Galicia, and herdsmen and milkers from Switzerland to supply the drainage of hands caused by the factories. Numerous Italians and French complete the tale of the inhabitants. With an area of 380 square miles, the Sundgau has a population of about 265 to the square mile. The article gives a lively picture of the natives driving their cattle to market, and of their buying and selling. The tall and sinewy frames of the peasantry of the Ill and upper Larg contrast with the thick-set but lively and talkative inhabitants of the southern part of Dammerkirch canton. The Sundgauer proper is described as upright, industrious, and frugal.

#### ASIA.

**Indian Surveys in 1905-06.**—The 'Extracts from narrative reports of officers of the Survey of India for the season 1905-06' are mainly occupied with more or

less technical matter, only the last item dealing with work of more general geographical interest. This has to do with survey work in the southern Shan States, carried out by a party under Lieut. R. H. Phillimore, R.E. The Kengtung State, which formed the principal field of operations, extends on both sides of the Salwin-Mekong divide (here formed by a lofty meridional range rising, in Loi Hpalan, to a height of 7626 feet), though more than half falls within the Mekong basin. The country is mountainous and broken, both ranges and river-valleys running generally north and south. On the Salwin side the principal rivers are the Nam Ping and Nam Hsim, the latter being the more important, and navigable in part. The valleys of both are generally narrow, and the sides are in great part wooded, though in places bare and rocky. The higher hills are covered with pine trees, but their slopes are gradual. Mules can cross the two ranges in several places, and there are foot tracks over many of the hills. The Nam Ping valley and the upper valley of the Nam Hsin are thickly populated by Shans, while the hills are occupied by various hill tribes—sturdy, efficient men—who do not descend below 4000 feet. On the Mekong side of the watershed are the capital of Kengtung and the only plain of any extent within its limits. Kengtung is a walled city of  $4\frac{1}{2}$  miles perimeter, with a population in 1901 of 6000. Its bazaar is the finest in the Southern Shan States. To the north lies a wide and densely populated plain, some 2600 feet in altitude. It is somewhat marshy, and unhealthy for Europeans during the rains. Throughout the area surveyed mists and haze seriously obstructed the surveys. During December and January mist hangs in the morning over every river and stream below 3500 feet, while in March the hill fires begin and help to produce a haze which grows thicker and thicker until the rains break. The first report in the volume gives a detailed account of the magnetic survey operations during 1905-06, with a summary of the present position, while the second describes pendulum operations undertaken, among other objects, with a view to ascertaining whether the deficiency in the force of gravity observed in the outer Himalayan zone near Dehra Dun and Darjiling would also be found near Simla. This proved to be the case, the deficiency proving to be of the same order of magnitude as at Mussuri. The operations extended as far west as Quetta, and among other results was the discovery that the observed value of  $g$  at Jacobabad was largely in excess of the computed value. A similar excess had been found in the plains of Bengal during the previous year.

**A German Gunboat on the Upper Yangtse.**—We learn from the *Geographische Zeitschrift* (1908, No. 4) that a voyage up the Yangtse above the rapids of the middle course of the river, almost to the limit of navigation at the foot of the Tibetan highlands, was made last year by the German gunboat *Vaterland*, commanded by Captain Toussaint. This was the first occasion on which the German flag had been displayed at Chungking. During the voyage especial attention was given to the charting of the rapids, and Captain Toussaint's report, published in the *Marine Rundschau* for February, 1903, is accompanied by a map on which the most dangerous rapids, with their rocks, shallows, etc., are laid down. The highest point reached was Suichou-fu at the mouth of the Min.

**Investigations in Hainan.**—M. Madrolle, who some years ago did some exploring work in Hainan, has undertaken a new expedition, which has the support of the Paris Geographical Society. His plans include both a study of the part of the island under Chinese influence and a visit to the central *massif*. Writing in December last to the Paris Society (*La Géographie*, vol. 17, p. 329), the traveller announced that he had reached Lea-mui, the last Chinese post, and was thence making a preliminary study of the aboriginal country in the centre of the island, the summits of which are in clear weather well seen from Lea-mui. A few days

later he reported to the Comité de l'Asie Française, which also supports the undertaking, that he had penetrated into the mountains, where he found himself in the midst of a wild, though not hostile, population.

#### AFRICA.

**French Exploration north of Lake Chad.**—A recent journey by Lieut. Ayasse from Ngigmi on Lake Chad to Agadem and Bilma is described in the issue of *La Géographie* for February last, which also contains notes by Captain Freydenberg on the geological results of the trip, together with a geological sketch-map of the region traversed. North of Ngigmi there are sandhills from which one can see Lake Chad, and thence to the oasis of Agadem the desert intervenes. Northwards again one has to cross a succession of sandhills between which lie long and narrow depressions. The passes through which the caravan had to make its way were not always easily discovered, and advance was naturally difficult. Bilma, the terminus of the trip, contains three salt-pits, whence salt is carried away in all directions in 25,000 camel-loads a year. It is consumed by the tribes to the south, and by the Tawarek and nomads of the Sahara. The rock specimens brought back have settled some interesting points in Central African geography. They show what was the greatest extension of Lake Chad—to Ngurti—and throw light on the two volcanic zones of Beduaram and Agadem, as well as on the granitic chain of the region north of Chad. The quartzites and laterites show that vulcanism extended beyond the limited areas at Beduaram and Agadem. The period of outflow was of long duration, and the eruptions must have been intense. The salt pits of Bilma and the presence of sodium show that a sea or lagoon covered the whole region. Of neolithic remains there are various stone implements—polished scrapers and arrow-heads. Axes and knives were obtained simply by polishing and rubbing pebbles. Traces of a regular industry are to be seen in the axe-heads of the south, while the arrow-heads of the Sahara tell a tale of nomad marauders.

**The Relative Levels of the Victoria and Albert Nyanzas.**—The fact that the difference in altitude between these two lakes had been determined by a line of levels was reported by Captain Behrens in a communication to the *Journal* for August, 1907, on the authority of Mr. R. C. Allen, chief surveyor for the Uganda Protectorate. We have since received further details from Mr. Allen, who in a memorandum on the subject describes the steps by which the final results (as regards the altitude of the Albert lake) were obtained. It appears that the difference in level between the zeros of the gauges at Entebbe and at Butiaba on the Albert Nyanza was obtained in 1905 by Mr. E. Richardson of the Uganda survey, by spirit-levelling (single, in one direction), the result obtained being 1690·66 feet. Assuming (as in Captain Behrens' paper in the *Journal* for March, 1907) that the zero of the lake gauge at Port Florence is 3720·15 feet above mean sea-level at Mombasa, and making the necessary allowances for the difference between the zeros of the Port Florence and Entebbe gauges, and for the level of the lakes above the zeros of the gauges, Mr. Allen finds that the mean altitude of the water-level of Lake Victoria was, in 1905-6, 3721·75 feet, and the (absolute) height of the water-level of the Albert-Nyanza, in July, 1905, 2029·48 feet. The difference in the level of the lakes has also been obtained, independently, by two other operations, the results showing a most satisfactory agreement. In 1907, a party of the Egyptian Survey Department, adopting the plan of double-levelling by two men in one direction, and comparing the results at regular intervals, obtained the value of 1690·59 feet for the difference between the zeros of the Butiaba and Entebbe gauges, while the same difference came out as 1690·20 feet as the result of trigonometrical levelling by the Uganda

Survey Department in the same year. As Mr. Allen remarks, this is a striking proof of the degree of accuracy obtainable by trigonometrical levelling.

**Journeys in the North-east of the Uganda Protectorate.**—Mr. H. A. C. Darley sends us a brief account of a trip made by him during the present year in the region between Lake Rudolf and the Nile. From a base camp near Marangole (see Major Powell-Cotton's map in *Geogr. Journal*, July, 1904, or that by members of the East African Syndicate, *ibid.*, May, 1905) he went south by the ordinary route to Magosi, and thence to the Tarash river. Crossing this, he pushed as far as Laramet, returning *viâ* the Turkwel, the northern side of Mount Moroto, Jiwe, and Dodosi. The Tarash rises on the northern, not the eastern, side of the range shown on the maps as the Murosoka hills, but of which, Mr. Darley says, the correct name is Loima, Moru Sokar being a largish hill on the western side, between which and the main range the Tarash issues through a narrow gap. This river runs, as was stated by Major Powell-Cotton, to a big swamp which only holds water during the rains. Close to the swamp are some water-holes, the water being apparently of a dangerous nature, for the country for miles round is covered with elephant bones, and both natives and traders say that if these animals drink the water they die. Mr. Darley secured a sample for analysis. The swamp is called Lakiboro, and receives two other rivers during the rains—one from Zunot, called Nanam; the other from Loniro, called Lolniro. Mr. Darley proposed to go on from Mbale to the Toposa\* (with whom he was on friendly terms, though they had recently killed three hundred Swahili), possibly afterwards proceeding to Rotilla. The people about Mbale talk the same language as the Turkana, it being largely founded on Masai, though they prefix the letter *y* to their nouns.

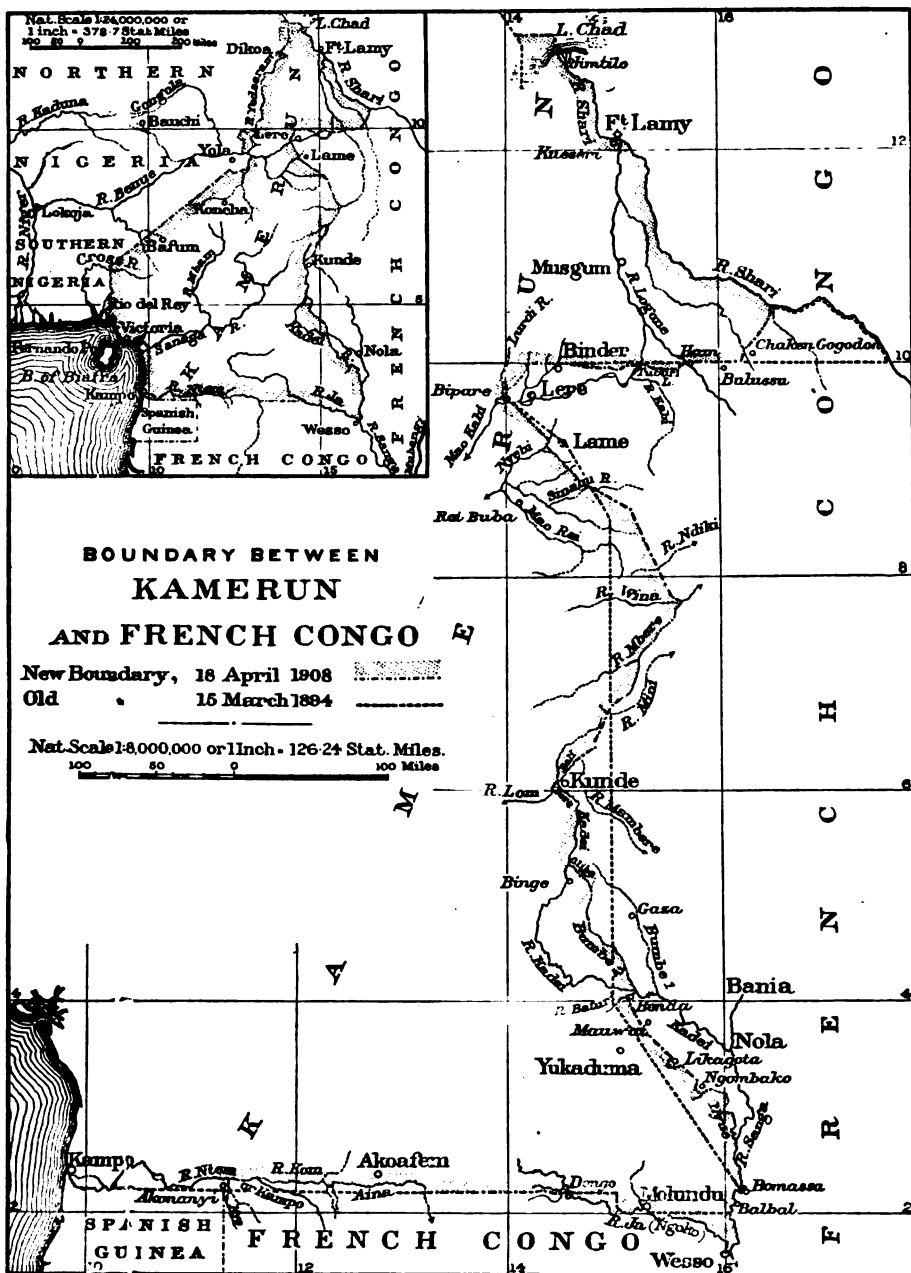
**The Duke of Mecklenburg's Expedition in Equatorial Africa.**—Further instalments of the Duke's report on the course of his expedition (*Journal*, vol. 31, p. 445) have been printed in the *Deutsches Kolonialblatt* (1908, Nos. 7, 9, and 12). They show that the scientific work of the expedition is being carried on with much energy, and that the labours of the various experts attached to it are likely to yield an unusually rich harvest of results. After completing their researches in the neighbourhood of Lake Kivu, the Duke and his party went northward in several detachments to the Albert Edward lake, continuing their march through the Semliki valley and by the shores of the Albert Nyanza to Mahagi, whence a westward route to the Congo State stations of Kilo and Irumu was taken. Separate expeditions were also made from time to time on one side or another of the direct route. Among the most interesting of these was one carried out by the Duke in company with Dr. von Raven and the head of the mission-station of Nyundo, to the little-known forest of Bugoie, east of Lake Kivu, in which the existence of the gorilla had been reported by the natives. After some trouble several specimens were secured, the first seen by a European in this district, though one or two specimens of a species named *Gorilla Behringei* at the Berlin Zoological Museum (with which that from the Bugoie forest would seem to be identical) had been previously obtained from the neighbourhood of the volcanoes to the north. Another interesting excursion was that to the most westerly of these volcanoes, Namalagira, which was ascended (for the first time from the south) by the Duke and several of his companions, including Dr. Kirchstein, the geologist of the party. It is the only one of the volcanoes at present in full activity, and the route led over a wide lava-field, due to the eruption of a parasitic crater in 1904. Dr. Kirchstein was witness, during his extended researches on this volcano, of a number of eruptions from the main crater, which is of very large size (some 3 miles

\* Dabossa of the East African Syndicate map.

in circumference). They took the form of discharges of ashes and lapilli, accompanied by loud detonations and discharges of gas. He was able on one occasion to descend a portion of the inner crater wall, and also discovered on the south side of the mountain a series of "embryonic volcanoes," as a similar phenomenon in Swabia has been named by Prof. Branco. During the march to the Albert Edward lake, over the Ruchuru plain, extraordinary quantities of game were seen, and the zoological collections received important accessions. They may be expected to throw valuable light on the various forms exhibited by many of the species in different districts of Africa, the buffaloes especially showing certain differences from those obtained elsewhere. From Beni, the important Congolese post in the Semliki valley, an expedition was made into the forest to the west, which exhibited quite a different flora from that hitherto met with. Some of the Monbutta pygmies were obtained as guides, and though they had not before been in touch with Europeans, they proved quick at taking in new ideas. Their colour was remarkably light. Information was here obtained of an animal named soli, which from the accounts appeared to resemble the okapi (also called kwapi), but which was said to possess an upright horn. A skeleton was subsequently obtained on the Ituri, and it is said to be an antelope with transverse stripes on the back, and with horns resembling those of the bush-buck, though of the size of an eland's. Information was also obtained in the forest which seemed to indicate the existence of an unusually small form of elephant. An expedition up the Butagu valley to the point on the slopes of Ruwenzori reached by Stuhlmann (and since by various other travellers) was made by Drs. Schubotz and Mildbraed (zoologist and botanist respectively), which considerably enriched the collections. Reports by these experts on the general results of the expedition from the point of view of biological distribution are printed in the latest issue of the *Mitteilungen a. d. Deutschen Schutzgebieten* (No. 2, 1908), to which we hope to recur later. It also contains the report by the topographer, Lieut. Weiss, who carried out valuable surveys until unfortunately invalided home. Another member of the party, Dr. von Raven, was also obliged to give up his part in the expedition, owing to injuries received from a buffalo. The latest communication from the Duke gives some particulars of the gold-mining operations at Kilo, in Congolese territory.

**The New Boundary between the Kamerun and French Congo.**—The accompanying sketch-map shows this boundary as laid down by the agreement signed at Berlin on April 18, 1908, by the German foreign secretary and the French ambassador. This agreement confirmed the protocol signed on the 9th of the same month by a joint commission of experts representing the two countries. The text of the agreement (embodying the above-mentioned protocol) is printed in the *Deutsches Kolonialblatt* for May 1, 1908, in which is also given a reduction of the official large-scale map by Max Moisel attached to the agreement. It will be seen that the new boundary deviates to a considerable extent from that laid down by the agreement of March 15, 1904, which consisted largely of conventional lines, while the new frontier is determined as far as possible by the courses of rivers or other natural features. It has been arrived at by a series of mutual concessions, each power having given up portions of territory at certain parts of the frontier, and received accessions at others. The towns of Kunde and Lame remain French, as provided by the old agreement; and in order to permit this in the case of Kunde a considerable area west of 15° E. is handed over to France, who also takes over a portion of the wedge of German territory which ran east between the Shari and 10° S., causing an exaggerated and unnatural zigzag in the former frontier. France likewise retains possession of Bipare, near the head of navigation on the Mao Kabi (Mayo Kebi), as to the exact position of which (on one side or the other of the

frontier) some controversy arose after Captain Lenfant's exploration of the water-route from the Benue to the Shari. Germany's principal gains are between  $9^{\circ}$  and  $7^{\circ}$  S., and in the extreme south-east corner of the Kamerun. Where the line cannot follow



a river, it is formed, as a rule, by straight lines joining specified points, such as fords on the rivers, or points defined by geographical co-ordinates. In Lake Chad the boundary runs from the main mouth of the Shari to the intersection of the meridian of  $14^{\circ} 28'$  E. of Greenwich with the parallel of  $13^{\circ} 5'$  N. Apart from the definition of the boundary, the agreement provides for the freedom of navigation on the waters of the Benue, Shari, Logone, and their affluents, within the respective territories, as well as on the Congo and on the Sangha and its affluents. Equal rights as regards the use of land communications are also accorded to the subjects of both powers in the portions of the basins of the Benue, Shari, and Logone falling within their territories, as also in the portion of French territory south of  $13^{\circ}$  S.; and this provision is also extended to include the route from Yola through Ngaundere, Kunde, Gaza, to Bania. The demarcation on the spot is to begin within four months of the ratification of the convention, and provision is made for the settlement of any difficulties which may occur in the process.

#### AMERICA.

**Inland Waterways of the United States.**—In the April number of the *Popular Science Monthly* for the present year, Dr. McGee discusses the inland waterways of the United States, with especial reference to the recent agitation for their improvement and further development. In 1787 a Convention was held at Philadelphia to discuss the inter-state management of the Potomac. Washington planned a canal to connect the tide-water region with the virgin Ohio country; Dewitt Clinton foreshadowed the Erie canal; Gallatin outlined a plan for national waterway improvement and commercial development. The growth of railroads during the nineteenth century caused these plans to remain undeveloped or in abeyance. The canals were almost all controlled by railroad corporations, and river traffic came to an end. All the while, however, production and population were outpacing the capacity of the railroads. In 1906, as the result of widespread desire for action, a Waterways Commission was appointed. All the possible waterways were studied by the commission itself and numerous independent conferences. The most pressing need was for navigation and carriage of freight. Although water-carriage involved only one-third the expense of that by rail, and one-ninth of the freight-lines were waterways, only one-twelfth of the commodities were carried by water. Production began to be checked because commodities could not be carried away. The suggestions made, therefore, are for a deep channel between the lakes and the gulf; an inner passage from Massachusetts to Florida; a canal from Minnesota and the Red river to Hudson bay through the grain-fields of Canada; and the opening up by waterways of the Pacific region, use being made of the Columbia, Snake, and Colorado rivers. The value of land is chiefly determined by the water on or in its substance; and it is estimated that 150 million acres of swamp and desert could be reclaimed, and be settled by 20 million people. The water-power capable of utilization is infinite. What is needed is that some one should act in the public interest.

**Mining in Minas Geraes.**—A Consular Report (Miscellaneous Series, No. 667) gives a detailed account of the mining industry in the state of Minas Geraes, which, with an area of 221,894 square miles, has a population of about 4,000,000. Its known minerals include gold, diamonds, precious stones, manganese, iron, cinnabar, platinum, galena, graphite, etc. A considerable section of the auriferous region, extending from Bahia to Goyaz, lies within the state. Gold is found in alluvial deposits and in veins and rocks. After assaying thousands of samples, a well-known authority concludes that the ore bodies are of a low grade, but profitably workable if the cost of mining were lower. The climate in the interior is

good. The temperature ranges from 56° to 82°. The rainy season is from November to March. The rainfall in 1903 was 49; in 1904, 58; and in 1905, 60 inches. Yet on the whole public health is not good. Tuberculosis, typhoid, and other diseases are favoured by the habits of the natives. The Morro Velho, the deepest gold-mine in the world, has been worked since 1830. In 1886 the mine caved in, but was re-opened in 1889, the lode being now intersected at a depth of 4264 feet. The Passagem mine, with the Borges and Santa Anna lodes, has been continuously worked since 1884. Eighty-three tons of ore from the Santa Anna mine yielded gold of the value of £252. The Brazilian diamonds are rivalled only by Indian. The best are found at Bagagem, Agua Suja, in the north-west; next come those of Diamantina, a deposit comprising a belt of country 120 miles by 12 to 20, including the basins of the Jequitinhonha, Doce, and San Francisco rivers. A railway is in course of construction to connect Diamantina with Victoria port. At Agua Suja was found the famous "Star of the south" diamond. On the Rio Doce malaria prevails. The Miguel Burnier manganese deposits, discovered in 1888, and worked since 1893, are situated close to the Central railway, on the Ouro Preto branch line, 313 miles from Rio de Janeiro. The Morro da Mina, in Queluz district, is said to be the largest manganese deposit in the world. A Government Geological Commission is about to investigate the mineral resources of Brazil. Capable of ranking as one of the chief mineral producers of the world, Brazil's present mineral export falls short of two per cent. of its total export.

#### AUSTRALASIA AND PACIFIC ISLANDS.

**Orography of Victoria.**—The highlands and main divide of Western Victoria form the subject of a monograph by Mr. T. S. Hart, F.G.S., in the *Proceedings of the Royal Society of Victoria* (vol. 20 N.S., part 2). This region forms an area occupied mostly by ancient rocks between the north-western and south-western plains. The line of division between the north and south flowing streams is spoken of as the main divide or dividing range. This barrier was used in the early days of the colony as an administrative boundary, but there was much dispute as to its right to the name it bears. Yet there is a greater difference between the animals and plants of Victoria, north and south of the range, than between the animals and plants of South Victoria and Tasmania. This seems to point to the fact that the divide is older than Bass strait. Biologically it obstructs the migration of plants and animals, and the climatic difference further affects their distribution. The easiest passes through the massifs are used as trade routes. The western highlands form a mass of Ordovician rocks, which are overlain by fluviatile and volcanic deposits. The general appearance of the region is that of a deeply dissected plateau. The upper rocks lie unconformably upon those underlying, and thus show that the morphology of their surface is due to excavation from above, not to accumulation from below. The volcanic plains were subsequent to the elevation and partial dissection of the peneplain. The valleys of the highlands run on the whole from north to south. The railway thus follows a switchback course, frequently rising to a height of 1100 to 1300 feet, as when it crosses the Grampians near Mount Ararat. The line of divide has been affected in direction by the lava intrusions and the work of river capture. The clue to the cause of the early divide is to be found in the movements of elevated and tilted fault blocks. These can be seen in profile. The valleys were formed primarily by faults, which allowed a succession of ranges to be formed from the same beds. To sum up, the dividing range consists of the unequal block elevations of a Mesozoic or Early Tertiary peneplain. This has been subsequently and extensively modified by volcanic activity and subaërial denudation.

**A Hamburg Expedition to the Pacific.**—An expedition for ethnological research in the Pacific has, as we learn from *Globus*, been organized by the Hamburgischer Wissenschaftliche Stiftung, under the direction of Prof. Thilenius, director of the Hamburg Ethnological Museum, who is himself known for investigations in the same field. In order to make the expedition independent as regards its means of locomotion, the *Petho*, a steamer belonging to the Hamburg-American line, has been chartered and fitted out with all appliances for the proposed research. The expedition includes six expert members, its leader being Dr. Fülleborn, whose ethnological investigations in East Africa are well known to geographers. The party sailed in May, and were to reach Hongkong during June, afterwards proceeding to the Bismarck archipelago, where operations will be begun.

#### MATHEMATICAL AND PHYSICAL GEOGRAPHY.

**Is the Sea-level rising?**—The question of the permanence or variability of the level of the sea, relatively to the land as a whole, is one which continues to exercise the minds of geographers. We referred last month (p. 570) to the conclusion of M. Négis, based on a study of ancient buildings on the shores of the Mediterranean, that a distinct rise in the relative level of that sea has taken place within historic times. A similar conclusion has been reached by Prof. Gnirs of Pola, who has himself carried out extensive investigations on the shores of the Mediterranean (particularly its eastern half), and has summarized the results, combined with a limited number due to other observers, in the *Mitteilungen* of the Vienna Geographical Society (1908, Nos. 1 and 2). His observations seem to have been carried out with care, and in basing conclusions on the existing position of ancient buildings, he has taken into consideration (in addition to the date of erection) such factors as the character of the structures and the purposes for which they were intended, the nature of the material used, the geology of the neighbourhood and the possibility of local land-movements, as well as the conditions of currents, etc., in the adjoining sea-areas. He also points out that some evidence may be supplied by an examination of the ground-water level and indications of its variation supplied by wells, etc. He likewise makes use of the data regarding ancient topography (his own special subject) supplied by early historical documents. The general result arrived at is, that throughout the whole region in question we have evidence of an almost universal rise of the sea-level to the extent of nearly 2 metres during the last 2000 years, the few places where it cannot be established being those in which there are indications of local movements of the land. In seeking an explanation of this consistent movement in one direction, Prof. Gnirs (unlike M. Négis, who had recourse to a supposed rise in the sea-floor) points to the evidences of general desiccation and retreat of glaciers at the present day, when we seem to be approaching the climax of an interglacial period; holding that the rise must be due to a corresponding increase in the volume of the sea, and quoting Penck as having shown that the reverse climatic movement during the glacial epoch must have *lowered* the general sea-level by as much as 70 metres (230 feet). A difference of 2 metres in 2000 years means an average yearly rise of 2 mm.—an amount quite capable of demonstration by careful observations extending over a series of years. Such, Prof. Gnirs points out, are available from the hydrographical station at Pola, and he quotes figures showing that a total rise in the sea-level to the extent of 3.20 cm. (1.3 in.) took place in the twenty-nine years from 1875 to 1904. The facts adduced are certainly striking, though many may hesitate to accept the explanation suggested. In view of the great differences known to exist between the levels of the sea in different regions, it would be rash to conclude that a rise demonstrated in any one locality must be universal; and if the Mediterranean

alone be in question, the desiccation of the surrounding region might be supposed rather to lower than to raise its level. Again, it would seem that, in an enclosed sea at least, some part of the result might be due to the transport of material from the land to the sea-floor, while the effect of deforestation in promoting the more rapid discharge of water into the sea might also deserve consideration.

#### GENERAL.

**Geography at Cambridge.**—It has been decided to reorganize the teaching of Geography at Cambridge University, in accordance with recommendations made by the Board of Geographical Studies. The existing Readership in Geography, which becomes vacant in the Michaelmas Term of this year, will not be continued, but its place will be taken by three Lectureships in Geography. Two of these will be known as the Royal Geographical Society lectureships, the Society's Council having promised to contribute £200 a year for three years to the Geographical Education Fund. One of these, the lectureship in regional and physical geography, will be in connection with the Special Board for Biology and Geology, while the other, concerned with surveying and cartography, will be in connection with the Special Board for Mathematics. The third lectureship, in historic and economic geography, will be under the Special Board for History and Archæology. We understand that special attention will be given by the General Board of Studies to the co-ordination of the three branches of the subject, and we may therefore hope that its unity will not suffer from the proposed distribution between three separate departments.

**Lectureship in Geography at Sheffield.**—Mr. R. N. Rudmose Brown, well known for the part which he took in the recent Scottish Antarctic Expedition, and joint author of the narrative of the voyage, has been appointed to the lectureship in geography recently instituted at the University of Sheffield. Mr. Brown, who is a son of the late Dr. Robert Brown, last year carried out, on behalf of the Indian Government, an investigation of the pearl fishery of the little-visited Mergui archipelago, off the coast of Southern Burma.

**Memorial to William Dampier.**—A suggestion originally made by Mr. W. Clark Russell, that the old navigator, William Dampier, should be commemorated by a memorial in the parish church of his native village, has lately been carried into execution. Dampier's birthplace was East Coker, near Yeovil, and in the ancient church of this Somersetshire village the memorial was unveiled on May 19 by Mrs. Heneage, of Coker Court, a direct descendant of the navigator. It takes the form of a marble slab, bearing a brass plate with inscription recounting Dampier's geographical achievements, together with representations of the vessels and nautical instruments of his time. There is also a medallion portrait of the navigator. The proposal had received the warm support of Sir Clements Markham, who thus once more displayed his interest in the deeds of the old naval worthies, and a contribution to the cost was also made by our Society.

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#### OBITUARY.

##### Sir John Evans.

THOUGH the late Sir John Evans was not in a strict sense a geographer, his wide interest in all branches of science, and the solid contributions to human geography which have resulted from his archæological researches, entitle him to more than

formal mention in this *Journal*. Born in 1823 at Britwell Court, in Buckinghamshire, and educated privately at home and in Germany, he became associated early in life with the well-known firm of John Dickinson & Co., of Nash Mills, in Hertfordshire, where he lived for more than fifty years, and accumulated the magnificent collection of prehistoric and other antiquities which made him one of the best known of European antiquaries. His earliest archaeological study was that of coins. His collection of ancient British coins was one of the finest in the world, and his connection with the Numismatic Society of London, which began in 1849, culminated in his election as president in 1874, and this office he retained till his death. His 'Coins of the Ancient Britons' was first published in 1864, and completed by a supplement in 1890. It introduced order for the first time into a most difficult and obscure department of archaeology by the systematic application of scientific methods to the collection and classification of the material, and in particular by emphasizing the importance of the geographical distribution of the places where isolated coins are found, as a guide to their centre of production.

But his best-known contributions to knowledge were in regard to the geological evidence for the earliest history of Mankind, and for the distribution of the first objects of human manufacture. He turned his attention at an early age to the study of geological structure in relation to water-supply, and thus became expert in the interpretation of those superficial deposits in which the earliest works of man were in due course to be detected. It was not without reason, therefore, that he was selected, in 1859, as one of a famous little band of English antiquaries and geologists to visit those gravels of the river Somme, in which Boucher de Perthes was claiming that he had discovered "worked flints," and who, by satisfying themselves of the accuracy of his observations, laid the foundation in England for the scientific study of Palæolithic man. Thirteen years later—in 1872—Evans published an unrivalled work on the 'Ancient Stone Implements, Weapons, and Ornaments of Great Britain,' and a similar volume on 'Ancient Bronze Implements' in 1881. In those two great treatises, he summed up practically the whole of the existing knowledge of these early works of man, and set Early British Archaeology on a firm scientific footing.

It is needless to enumerate in detail the distinguished services of Sir John Evans to geology and the study of man. He became president of the Geological Society in 1874, of the Anthropological Institute in 1877, and of the Society of Antiquaries in 1885, and in the latter capacity established, as an *ex officio* trustee of the British Museum, a position in the councils of the Museum which secured his nomination in due course as a permanent trustee, and one of its most active managers. In 1878 he became treasurer of the Royal Society, and in his twenty years' tenure of this office had ample opportunity for the exercise of his high ability as a financier and man of business. In 1879 he presided over the British Association on the occasion of its meeting at Toronto, and was for long an assiduous and highly valued member of its council. He was created K.C.B. in 1892, and was the recipient, in due course, of many complementary degrees and similar distinctions from universities and academies all over the world.

To the rare combination of great business ability and wide and varied scientific interests, Sir John Evans added a high degree of classical scholarship and literary taste; a strong devotion to the district in which he lived, of which he was an able and respected administrator in many capacities; and, above all, a personal charm which endeared him, not merely to the large circle of friends whom he loved to gather in his beautiful museum home, but to the larger world of students of every degree in the subjects nearest his heart.

## OBITUARY OF THE YEAR.

THE following is a list of the Fellows who have died during the year 1907-1908 (April 30):—

LORD ALDENHAM; Sir JOHN ABDAGH; Dr. ROBERT BARNES; MATTHEW BLAKISTON; Sir D. BRANDIS; T. W. BUSHILL; E. BIBBY; R. VICARS BOYLE; WILLIAM BRODIE; Captain W. BUCKLEY; H. L. BISCHOFFSHEIM; Colonel A. W. BAIRD; Colonel H. F. BLAIR; Lieut. J. BENNETT-YATES; Commander CASBERD-BOTELEH; JAS. COATE; G. B. CHACE; ROBERT INGHAM CLARK; WM. CLAUSON-THUE; Earl of CLANWILLIAM; Major-General Sir J. F. CREASE; JOHN CLEGHORN; Captain C. F. CROMIE; Colonel Sir H. COLVILLE; J. D. CAMPBELL; Captain G. N. CONLAN; N. H. COHEN; W. CALLOW; EBENEZER CAYFORD; RODERICK CAMPBELL; H. A. COCKERELL; H. A. N. DUNSFORD; JOHN DODD; Earl of DUNMORE; Mrs. DORMER; D. DRAKE; General Sir JOSEPH FAYRE; J. GIBSON FLEMING; Captain G. B. GOSLING; C. L. GRIESBACH; Sir FREDERIC GOLDSMID; G. A. GRAHAM; S. G. GLANVILLE; C. J. R. GARDINER; F. G. HENRIQUES; HARRISON HODGSON; HENRY HAGUE; D. E. HUME; Prof. A. HEILPRIN; Rev. W. A. JOLLEY; C. E. JOHNSTON; D. J. KENNELLY; H. R. KNIGHT; FRANK KARUTH; F. R. KENDALL; JOHN LECKIE; N. J. LYON; Rev. W. G. LAWES; J. T. LEONARD; J. G. LANGHAM; Admiral MARCUS LOWTHER; Sir J. D. MILBURN; Admiral J. F. L. P. MACLEAR; Sir F. LEOPOLD MCCLINTOCK; W. E. MALCOLM; M. G. MORRISON; H. A. MANGLES; Admiral Sir MERVYN B. MEDLYCOTT; A. H. NEUMANN; Colonel J. A. NUNN; Mrs. MARY L. O'DONOGHUE; G. M. OGILVIE; Captain HENRY OWEN; Lord OVERTOUN; Lieut. G. F. PHILLIPS; HENRY MONCREIFF PAUL; Lord EDWARD PELHAM CLINTON; Captain G. PIRIE; ROBERT PAUL; Dr. E. J. ROUTH; T. J. ROBERTSON; Captain G. W. READ; WALMSLEY STANLEY; Major-General SYNGE; HOWARD SAUNDERS; JOHN STUART; Rev. F. A. STEWART-SAVILE; F. H. R. SAWYER; R. S. SLY; General Sir RICHARD STRACHEY; J. BENJAMIN SCOTT; ROBERT SWINDELLS; Captain BUCHAN TELFER; Dr. FRANCISCO URIBURU; F. R. S. WYLLIE; Admiral THOMAS LE HUNTE WARD; GEORGE GRAY; JOHN WAITE; ROBERT WHARTON; F. F. ZEHETMAYR.

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## CORRESPONDENCE.

### Journeys of the late W. H. Johnson.

It would appear, from Dr. Workman's letter in the June number of this *Journal* (p. 683), that he still confuses Johnson's journey of 1864 with that of 1865. In his paper in the *Journal* for January last (p. 26), Dr. Workman, in discussing the possibility of Johnson having camped at over 22,000 feet, said that "it must have been on the peak E 61, the only peak in the neighbourhood exceeding 22,000 feet." Having placed Johnson's camp on E 61, he then proceeds to pull down the mountain. I pointed out (p. 345) in the letter he now replies to, firstly, that this camp could not have been situated on E 61 (see *Alpine Journal*, 1884, vol. 12, p. 58; *Proceedings R.G.S.*, 1875, vol. 19, p. 362; and 'Synopsis of Results, etc., G.T.S.' vol. 7, p. 39); and, secondly, that in the range of the Kuen Luen, of which E 61 (now Muztagh K<sub>2</sub>) is, according to the latest surveys, the culminating point, there are five other measured peaks of over 23,000 feet (see latest maps and Dr. Stein's views of the Kuen Luen now in course of publication by the Society).

I have dealt more fully with some of Johnson's very remarkable but little-known mountaineering achievements in a paper in the *Alpine Journal*, which I am

told will be published in the May number this week, and to which I would refer any one interested in the history of Himalayan ascents.

T. G. LONGSTAFF.

June 4, 1908.

[*This correspondence cannot be continued.*]

### The Westernmost Feeders of the Nile.

The Black Watch, Kilbegan, June 10, 1908.

It is with no wish to enter into what must be an unconvincing discussion that I beg to write to contradict some of Captain Perceval's contradictions. My deductions were not second-hand ones, and I venture to point out that the Arabic word meaning "custom" is spelt with a different letter to that of the penultimate syllable of "Barada." I spent very nearly a month at Kafiakingi. I regret that I took for granted that the "Um" preceding the names of several rivers is the Kreish word for "river." I did not verify it at the time. The small stream near Kafiakingi is known at times to illiterate natives as the (*Um*)-vongo. The Umbelacha is the well-known stream; the Umbom is a small perennial stream between the latter and former. That the Barada should be known as *Umarada* bears out my contention. (I did not know that Schweinfurth came further north than Dem Zubeir.)\*

As to size, the Umbelacha 40 miles north-west of the Barada (*i.e.* near Hofrat en Nahas) is quite one-third, if not half, again larger than the Barada.

As to the festival. It is a well-known one at Khandak, where the miracle tree and oracle have been for generations. This is 10 miles from Kafiakingi, and not on the river, I was informed. I did not go there myself.

In that very hilly district quite a number of streams of some size flow into both rivers; some quite considerable ones were passed by me on my way to J. Migi.

D. COMYN.

## MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1907-1908.

*Anniversary Meeting, May 25, 1908.*—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

THE Secretary read the Minutes of the last Anniversary Meeting, which were confirmed and signed by the President.

The Secretary read the list of newly elected Fellows.

ELECTIONS.—*Charles H. Laurance Alder; A. Bishop; C. L. Chevalier; J. S. Coates; Wm. Edwin Gase; R. G. Grieve, M.A.; George Hepworth; S. M. L. Iredell; Captain E. M. Jack, R.E.; Rev. Thomas Broadwood Johnson; Captain H. H. Kelly, R.E.; The Earl of Kingston; Stanley Knowles; W. Kennedy Laurie Dickson; Lieut. Leander McCormick-Goodhart, R.N.; Hon. Robert McNab; Wm. Arthur Moore; Captain Stanley Musgrave; Hon. F. R. D. Prittie; Stanley Unwin; Harry Gordon Webb, M.R.C.S.; Mark Arthur Wolff.*

\* Captain Perceval was not responsible for the reference to Schweinfurth, which seems to have been incorrect. That traveller did print an itinerary through the Kreish country, but the first mention of the Ada seems to have been made by Potagos (1876-77).—(Ed. G.J.)

## THE PRESENTATION OF MEDALS AND OTHER AWARDS.

**THE PRESIDENT:** The next business on our Agenda is the presentation of the medals and other awards, and I will in the first place call on Lieut. Boyd Alexander to receive his award. Lieut. Boyd Alexander, with the consent of His Majesty, the Society has awarded to you the Founder's Medal for the following reasons: After having spent some time in Fernando Po and on the west coast of Africa, mainly in natural history research, you organized a thoroughly well equipped expedition with an adequate staff, which left England in February, 1904, and spent three years in the exploration of the region between the Benue and Lake Chad, from Lake Chad along the Shari, down to the northern tributaries of the Congo, made its way along the Welle, from the upper waters of which the expedition crossed to the Nile basin, descending the Yei to the Bahr el Jebel and so down the Nile to Cairo. During this extensive journey a careful trigonometrical survey was made of the region between the Benue and Lake Chad. You devoted a considerable time to the exploration of Lake Chad, and added materially to our knowledge of that constantly shifting lake. A careful study was made of the hydrography of the various river systems, the Niger, the Congo, and the Nile, through which the expedition passed. Detailed maps were made of the more unknown parts of the region, such as the Bamingi, Kibali, and the Yei rivers. Much information was gathered concerning the physical features of the region passed through; careful studies were made of several of the types of natives, and important additions were made to our knowledge of the natural history of the extensive region. The expenses of the expedition were entirely defrayed by yourself and your friend, Captain Gosling, who died in the midst of his work. Altogether, your expedition, from a scientific point of view, was one of the most important that has entered Africa for many years. I have great pleasure in presenting to you the Founder's Medal.

**Lieut. ALEXANDER:** I thank you very much indeed for the great honour which your illustrious Society has given me—an honour, I might add, most coveted by all keen geographers; but when I think of the work which attained this honour, I cannot forget that there are others who gave more than I did, namely, their lives, and so I shall cherish always this splendid honour, and hold it in part for them. Sir George Goldie, I thank you very much indeed.

**THE PRESIDENT:** The Society will regret the fact that the recipient of the Patron's Medal, His Highness, the Prince of Monaco, is unable to attend to-day, because, as you will have seen in the papers, he has been suffering from severe illness. His Highness hopes, however, that a little later in the season, perhaps some time in June, he may be able to come to London and receive from the Society the Patron's Medal, which we had hoped to have given him to-day.

The Murchison Award for 1908 has been given to Colonel Delmé-Radcliffe for his important work, when, as resident in the Nile province of Uganda, he mapped the whole province, and for the excellent work which he did afterwards when in charge of the English section of the Anglo-German Boundary Commission, between Victoria Nyanza and Mount Ruwenzori. Colonel Delmé-Radcliffe cannot be here himself, but I am charged to hand his diploma to Dr. Scott Keltie, who will transmit it to him.

The recipient of the next award, the Gill Memorial, is present to-day. It is Dr. Longstaff, and I will ask him to be good enough to come upon the platform. Dr. Longstaff, the Gill Memorial for 1908 has been awarded to you for the important exploring work which you did at your own expense in the Western Himalaya and Tibet, and especially on your last expedition in the Garhwal

Himalaya, when you ascended the summit of Trisul. It is a very great satisfaction to me to present this award to you.

Dr. LONGSTAFF: I thank you very much for this award; it will be a great encouragement to me to try to do more in future. Perhaps I may say that I am very proud to have my name associated with that of Captain Gill.

The PRESIDENT: The Back Bequest for 1908 is awarded to Lieut. Mulock for his survey work on the National Antarctic Expedition, and for his long-continued work in preparing the six sheets of Antarctic charts. Lieut. Mulock, I need hardly tell you that the Society are fully alive to the great merits of the work which you have done.

Lieut. MULOCK: I am deeply grateful for this generous recognition of my services, and am keenly sensitive to the honour which you have done me in nominating me to be the recipient of the Back Bequest. I should like to take this opportunity of acknowledging the deep debt of gratitude I owe to Sir Clements Markham, Admiral Markham, Captain Scott, Captain Percy Cust, and Captain Colbeck for affording me the opportunity of earning this award.

The PRESIDENT: The Outhbert Peak Grant for 1908 has been awarded to Rai Sahib Ram Singh, native Indian surveyor, who has done excellent surveying work on the expeditions of Captain Deasy, Dr. Stein, Captain Rawling, and Major Ryder. He has been asked what form his award shall take, and we have not yet heard from him. His diploma is here, and I propose to hand it to Sir Thomas Holdich, and ask him to say a few words on behalf of Ram Singh.

Sir THOMAS HOLDICH: Sir George Goldie, I need hardly say that it gives me the very greatest pleasure to accept an award which is given to one of that great staff of geographers in India, with whom I have been so very long associated. I would venture to remind a late chief of mine who is here of what he once said in his report after a very long protracted geographical exploration in the far regions of the Oxus. He said the Government of India have no better body of servants than the native surveyors of India. I am not personally acquainted with Ram Singh, but I can assure you of this, that he is one of the best.

The President then delivered his anniversary address (see p. 1).

After the visitors had withdrawn, the PRESIDENT said: It is now my business to appoint scrutineers for the ballot which will be taken presently, and I name Mr. Gladstone and Captain Stiffe.

My vacating to-day the office of President calls for some remarks personal to myself and to my colleague whom the Council proposes to you as my successor. I have had so many inquiries, both written and verbal, why I have not allowed myself to be nominated for election for another term, that it seems due to the Society to state to you very briefly my only but sufficient reason—I have already stated it to my colleagues on the Council—for refusing definitely to stand again to-day as a candidate for an office, the honour and interest of which I have deeply appreciated.

I hold strongly that, except in very special circumstances, three years is the extreme continuous period; that any one should occupy this chair. The long presidency of my distinguished predecessor was desirable on quite exceptional grounds. Our National Antarctic enterprise took years to initiate and bring to maturity, and further years to organize and carry to completion. It was desirable that the conduct of this enterprise, which involved both the reputation of our Society and a large portion of its capital, should remain in the hands of a single, responsible, and competent expert from its initiation to its close. Moreover, Sir Clements Markham had a world-wide reputation as a geographer long before he was elected to this chair in 1893. No corresponding special reasons now exist to

justify my breaking what I hold to be a necessary rule if our Society is to maintain its vitality. I also attach great importance to the principle of not unduly blocking the path of promotion of those who serve the Society on its Council. This principle is supported by precedent. During the sixty-two years from the founding of the Society to the accession of my predecessor, the presidency changed hands twenty-eight times, giving an average of a little over two years of continuous occupation. I have held the office for three years, and I quit it with sincere regret.

That regret, however, will be lessened if you elect as my successor the candidate recommended to you by the Council, Major Leonard Darwin. For fifteen years he has been not only honorary secretary, but also an assiduous worker in that post, as those of us who have been on the Council throughout that period can vouch. He possesses, consequently, an exceptional knowledge of the intimate working of our Society, and of both its potentialities and its limitations. Not only past and present members of the Council, but also many others of our Fellows, have had opportunities of recognizing his exceptionally sound judgment, his impartiality of view, and his openness of mind—to say nothing of the chief of all qualities, painstaking industry. I am confident that under his guidance the labours of our Council and Committees would combine the vigour and smoothness so essential to effective work. I may perhaps add that there would be a special fitness in his election at this time, as next year is the Darwin Centenary.

Sir THOMAS HOLDICH: I think this is a good opportunity for me to ask you, as a Society, to join in a cordial vote of thanks to Sir George Goldie for the great services he has rendered to the Society during his tenure of office. We are all of us proud to know that the Society has never wanted able or distinguished men to assist its Council. We have had in the list of Members of Council men distinguished in almost every walk of life, but I doubt whether we have had any one who has given such heart-whole energies for the benefit of the Society as has Sir George Goldie. It is not for me here and now, to enter into any eulogy of Sir George Goldie's public career for several reasons. In the first place I consider that his services to his country are part of this country's history; in the second place to summarize even a part of them would take a long time; and thirdly, I have a strong suspicion that Sir George participates in the prejudice against speeches of this sort, which was expressed to me by another great man, when he said, "I would rather not listen to an obituary notice before I am ready for it." But what Sir George Goldie has done for this Society we all know. We know that at the time when he took charge the financial state of it was not, perhaps, all that could have been desired. Large expenditure had been incurred in connection with the Antarctic expedition, and it required very great and careful attention to the finances of the Society to bring out a satisfactory issue on the balance sheet. This very ungrateful task, the task of revising estimates and cutting down expenditure, Sir George Goldie took in hand, and I think I may fairly say that he thoroughly and successfully revised the financial position. He leaves the Society now thoroughly sound. That is not all. I think we have also to thank Sir George Goldie for his insistency in supporting the movement for the spread of geographical education in this country, and for making the Society fully sustain its share in that movement. Now we all know what the position was some few years ago, and most of us can mark the difference that has occurred. From highest to lowest, I may say from the Foreign Office to Board Schools, geography is now recognized as an integral part of every citizen's education. It was not so three or four years ago, and I think that for the success of this movement so far, and for the support which we have gained all round the country from universities and educational centres generally, we have chiefly to thank Sir George Goldie. It was, at any rate, his hand that started

it, and I think he may fairly depend on the Council that he leaves behind him to keep that movement going. In short, Sir George leaves the Society in a strong financial position; with an enhanced reputation; and with an increasing sphere of usefulness. I may ask you, then, cordially to thank Sir George Goldie for all that he has done for the Society.

LORD BELHAVEN: It is my very pleasing duty to second this vote of thanks. We all, who have served on the Council, have had the very greatest advantage by the presidency of Sir George Goldie during his term of office, and we did press him very much to stay longer as President of the Society, but he has explained to you his reasons for his refusal. I can only cordially support the words which Sir Thomas Holdich has used. I beg to second this motion.

SIR THOMAS HOLDICH: I will now put it to the meeting; his services are recognised by us, and we cordially thank him for all he has done for the Society. Carried unanimously.

SIR GEORGE GOLDIE: It is a little difficult to speak at one's own funeral. I shall only say a very few words: you will not measure my feelings by the length of my remarks. I cannot tell you how deeply I feel the recognition you have just given to such services as I have been able to render. I am afraid that you value them more highly than they deserve, but I feel most deeply the sympathy that there is between your retiring President and the Society. It is a great pleasure. If I have done any work for the Society, I am amply repaid for it at this moment. I thank you from my heart.

The report of the Council was then read. It will be published in the next Year-Book.

THE PRESIDENT: I have now to announce to you the report of the scrutineers, namely that the Council list has been adopted unanimously, with this exception, that one of the Fellows has proposed, as President, the name of Lord Curzon. I may tell you that I have approached Lord Curzon repeatedly during the last two years to induce him to be a candidate for the Presidency.

This concludes the Anniversary Meeting, and the Special General Meeting, of which notice has already been given, will now commence.

SIR THOMAS HOLDICH: I beg to move that Sir George Goldie be asked to take the chair.

The Council list is as follows, new members or those changing office being printed in italics:—

*President: Major Leonard Darwin.* *Vice-Presidents: Sir Harry H. Johnston, G.C.M.G., K.C.B.; Right Hon. Lord Curzon of Kedleston, G.C.S.I., G.C.I.E., etc.; Douglas W. Freshfield; Right Hon. Sir J. West Ridgeway, K.C.B., G.C.M.G., K.C.S.I.; Colonel Sir Colin C. Scott-Moncrieff, R.E., K.C.M.G., K.C.S.I.; Sir Clements Markham, K.C.B., F.R.S., F.S.A.* *Treasurer: Edward L. Somers Cocks.* *Trustees: Right Hon. Lord Avebury, D.C.L., F.R.S.; Lord Belhaven and Stenton.* *Hon. Secretaries: Major Charles F. Close, C.M.G., R.E.; Colonel Sir D. A. Johnston, K.C.M.G., C.B., R.E.* *Foreign Secretary: Sir John Kirk, K.C.B., G.C.M.G., F.R.S.* *Councillors: Henry Balfour, M.A., F.Z.S.; Admiral Sir Lewis Beaumont, K.C.B., K.C.M.G.; Colonel G. Earl Church; Sir Martin Conway, M.A., F.S.A.; Admiral A. Mostyn Field, F.R.S.; Colonel H. W. Feilden, C.B.; J. Stanley Gardiner, M.A.; Sir David Gill, K.C.B., LL.D., F.R.S.; Right Hon. Sir George D. Taubman Goldie, K.C.M.G., F.R.S., D.C.I., LL.D.; Colonel R. C. Hellard, C.B., R.E.; Sir Clement L. Hill, K.C.M.G., C.B., M.P.; Colonel Sir Thomas Hungerford Holdich, K.C.M.G., K.C.I.E., C.B., R.E.; James F. Hughes; Right Hon. Lord Lamington, G.C.M.G.; Dr. T. G. Longstaff; Sir George S. Mackenzie, K.C.M.G., C.B.; Earl of Ronaldshay, M.P.; Dr. Aubrey Strahan, F.R.S.; H. Yates Thompson; Professor W. W. Watts, F.R.S.; Colonel C. E. Yate, C.S.I., C.M.G.*

*Special General Meeting, May 25, 1908.*—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., LL.D., F.R.S., in the Chair.

This meeting was summoned in accordance with the bye-laws, chapter vi. section 2, paragraphs 1, 3, and 4, for the purpose of considering a proposal by the Council that the annual subscription and the compounding fees should be raised in the case of all Fellows joining after the date of the meeting.

After some discussion the meeting adopted an amended resolution that after the date of May 25, 1908, the entrance fee should be £5, and the annual subscription £3; that the compounding fee on entrance should be £45, and at any subsequent period on the following scale, provided that there should be at the time no arrears due to the Society—

Fellows of 10 years' standing and under 15	...	...	£30
" 15 " " " 20	...	...	£24
" 20 " " over 20	...	...	£18 15s.

It was also decided that subscription and compounding fees of Fellows elected before or on May 25, 1908, should remain as heretofore, namely the annual subscription £2, and the compounding fee—

Fellows of 10 years' standing and under 15	...	...	£20
" 15 " " " 20	...	...	£16
" 20 " " over 20	...	...	£12 10s.

#### ANNIVERSARY DINNER.

The Anniversary Dinner took place in the evening at the Whitehall Rooms of the Hôtel Métropole. Major Leonard Darwin, the President, was in the chair, and among those present were: the Italian Ambassador, the Norwegian Minister, the Vice-Chancellor of Cambridge, the Principal of the University of London, Right Hon. Lord Belhaven, Sir Henry Bulwer, Sir W. Lee Warner, Lord Joicey, Captain R. Muirhead Collins (Representative of the Australian Commonwealth), Colonel Sir T. H. Holdich, Sir A. Rucker, Lord Colchester, Admiral Sir Lewis Beaumont, Mr. G. E. Buckle, Right Hon. Sir George T. Goldie, Sir F. C. Gould, Sir Clement Hill, Sir C. P. Lucas, Colonel Hon. M. G. Talbot, Dr. Marconi, Sir William Ramsay, Admiral A. Mostyn Field, Sir Robert Morant, Colonel R. Hellard, Lieut. Boyd Alexander, General Sir Thomas Fraser, Mr. Fabian Ware, Mr. H. Yates Thompson, Dr. Teall, Dr. Glazebrook, Colonel C. E. Yate, Dr. A. Strahan, Colonel Sir Duncan Johnston, Major C. F. Close, Mr. Edward L. S. Cocks, Mr. C. W. Hobley, Mr. Louis Becke, Prof. Sollas, Mr. D. G. Hogarth, Mr. Laurence Gomme, Dr. Kimmins, Colonel Fellden, Sir George S. Mackenzie, Colonel G. E. Church.

After the toasts of "Our Patron, the King," and "Our Vice-Patron, the Prince of Wales," the PRESIDENT proposed the toast of "The Medallists," to which Lieut. BOYD ALEXANDER replied. The PRESIDENT then proposed the toast of "The Retiring President, The Right Hon. Sir George T. Goldie, K.C.M.G.," which was responded to by Sir GEORGE GOLDIE. The toast of "The Guests" was proposed by Colonel Sir T. H. HOLDICH, which was responded to by H.E. the Italian Ambassador, Dr. G. MARCONI, and Sir FRANCIS CARRUTHERS GOULD. The toast of "The Universities" was proposed by Mr. D. G. HOGARTH, and responded to by the Vice-Chancellor of Cambridge University.

Dr. J. J. H. SMALL proposed the toast of "The President and the Society," which was responded to by the PRESIDENT.

*Fifteenth Meeting, June 15, 1908.*—Major LEONARD DARWIN, President, in the Chair.

ELECTIONS—*Moritaro Abbé*; T. E. Andrews, B.A.; Henry Oliver Beckit, M.A.; A. C. P. Birch; N. de L. Davis, B.A.; Prof. T. E. Everard; William C. Farabee; Rev. T. J. Williams-Fisher, B.A.; Robert Vaughan Gower; H. A. Hetherington; John Holdsworth; Samuel James Hutchinson; Hugh Kirkhope, M.A.; W. J. Laidlay, B.A.; Harold B. Lewin; John McFarlane, M.A.; Charles A. G. Mackintosh; Nicol Finlayson Mackenzie; George Marvin; Charles Phillips; P. M. Rooby, B.A.; Arthur John Sargent; Rev. Edward Clarke Spicer, M.A.; R. L. Thompson, B.A.; Herbert Comyn Walker; J. H. L. York, B.A.

Major DARWIN, the President, said: In taking the chair as President for the first time, may I be allowed to thank the Fellows here present for the great honour they have done me in electing me to that office? I fully recognize the responsibility entailed in assuming this post, and I can only say that I trust that the confidence reposed in me will not be mistaken. Before proceeding to the business of this evening, I am quite sure that you will wish me to welcome in your name the representatives here present of the Commercial Geographical Society of Paris. Politics here are strictly excluded, but I am quite sure that within that unwritten rule we do not include expressions of friendship to friendly nations. The *entente cordiale* between England and France is now so thoroughly established that it is specially pleasing, on an occasion of this sort, to welcome French geographers of distinction amongst us. We have here to-night several French geographers representing this society who have done admirable work in various quarters of the globe. We have M. Dupuis, the *doyen* of French explorers; M. Chevalier, whose work on Lake Chad is so well known in this country; we have M. Labbé, the secretary-general of the society; and M. Gaudy, treasurer, and a geographer of distinction. To all of these, and to the representatives of the other aspects of this society, such as Le Comte de Saint Clair, Consul-General, I am sure you will wish me in your name to offer the very heartiest reception.

The paper read was:—

"Journey on the Upper Salwin." By George Forrest.

## GEOGRAPHICAL LITERATURE OF THE MONTH.

### *Additions to the Library.*

By EDWARD HHAWOOD, M.A., *Librarian, R.G.S.*

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Académie, Akademie.  
 Abh. = Abhandlungen.  
 Ann. = Annals, Annales, Annalen.  
 B. = Bulletin, Bollettino, Boletim.  
 Col. = Colonies.  
 Com. = Commerce.  
 C.R. = Comptes Rendus.  
 E. = Erdkunde.  
 G. = Geography, Géographie, Geografia.  
 Ges. = Gesellschaft.  
 I. = Institute, Institution.  
 Ia. = Izvestiya.  
 J. = Journal.  
 Jb. = Jahrbuch.  
 k.k. = kaiserlich und königlich.  
 M. = Mitteilungen.

Mag. = Magazine.  
 Mem. (Mém.) = Memoirs, Mémoires.  
 Met. (mét.) = Meteorological.  
 P. = Proceedings.  
 R. = Royal.  
 Rev. (Riv.) = Review, Revue, Rivista.  
 S. = Society, Société, Selakab.  
 Sc. = Science(s).  
 Sitzb. = Sitzungsbericht.  
 T. = Transactions.  
 Ts. = Tijdschrift, Tidakrift.  
 V. = Verein.  
 Verh. = Verhandlungen.  
 W. = Wissenschaft, and compounds.  
 Z. = Zeitschrift.  
 Zap. = Zapiaki.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 x 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

## EUROPE.

- Adriatic Sea.** *G. Jahresbericht Österreich 6* (1907) : 1-14. **Grund.**  
Die Entstehung und Geschichte des Adriatischen Meeres. Von Dr. Alfred Grund.  
*Sketch-map and Section.*
- Alps.** **Schmidt.**  
Bild und Bau der Schweizer Alpen. Von Dr. Carl Schmidt. (Beilage zum Jahrbuch der Schweizer Alpen Club, Jahrgang xlii., 1906-07.) Basel, 1907. Size 10 x 7, pp. 92. *Maps, Sections, and Illustrations.*
- Alps—Anthropogeography.** **Sieger.**  
*Verhandl. XVI. Deuts. G.-tages, Nürnberg* (1907) : 262-272.  
Zur geographie der zeitweise bewohnten Siedlungen in den Alpen. Von Prof. Dr. Robert Sieger.  
See note in vol. 30, p. 557.
- Alps—Phytogeography.** **Thompson.**  
Liste des phanérogames et cryptogames vasculaires recueillis au-dessus de 8000 feet (2440 metres) dans les districts du Mont-Cenis, de la Savoie, du Dauphiné et des Alpes-Maritimes (Juin-Septembre, 1907) ; avec quelques notes sur les limites altitudinales des plants alpines. Par Harold Stuart Thompson. Le Mans, 1908. Size 9½ x 6½, pp. 195-248. *Sketch-map.*
- Austria—Bohemia.** *La G., B.S.G. Paris 17* (1908) : 1-16. **Machaček.**  
Nouvelles observations géomorphologiques sur le massif de la Bohême. Par Dr. Frits Machaček. *Illustrations.*  
See note in the May number, p. 562.
- Austria—Carniola.** *G. Jahresbericht Österreich 4* (1906) : 9-74. **Lucerna.**  
Gletscherspuren in den Steiner Alpen. Von Dr. Roman Lucerna. *Map, Illustrations, and Sections.*
- Austria—Istria.** *G. Jahresbericht Österreich 4* (1906) : 75-85. **Krebs.**  
Verbogene Verebnungsflächen in Istrien. Von Dr. Norbert Krebs. *Sections.*
- Austria—Meteorology.** *G. Jahresbericht Österreich 6* (1907) : 15-65. **Deutsch.**  
Die Niederschlagsverhältnisse im Mur-, Drau- und Savegebiete. (Für den Zeitraum 1891-1900.) Von Dr. Paul Deutsch. *Map and Diagrams.*
- Central Europe—Communications.** *B.S.R. Belge G. 31* (1907) : 413-434. **Clerget.**  
Les communications transalpestres. Étude de géographie économique. Par Pierre Clerget. *Sketch-map.*
- Danube.** *Petermanns M., Ergänzungsheft 160* (1908) : pp. iv. and 64. **Cvijić.**  
Entwicklungsgeschichte des Eisernen Tores. Von Dr. J. Cvijić. *Maps, Illustrations, and Sections.*  
See note in the March number, p. 332.
- Danube.** *Naturw. Wochenschrift 23* (1908) : 97-109. **Endriss.**  
Die Rheinische Donau. Von Prof. Dr. K. Endriss. *Maps and Illustrations.*  
See note in the April number, p. 440.
- English Channel.** **Butler and Turner.**  
Channel Tunnel. Reports by British and French engineers. Papers on national defence, by General Sir William Butler, Major-General Sir Alfred E. Turner, and Vice-Admiral Sir Charles Campbell. London : W. T. Perkins, 1907. Size 11 x 8½, pp. 56. *Maps, Illustrations, and Diagrams.*
- Europe—Seismology.** *Atti R.A. Lincei, Rendiconti 16* (1907) : 1 Sem., 916-920. **Monti.**  
Di alcune possibili relazione tra la sismicità della Svizzera e quella dell'alta Italia. Nota di V. Monti. *Sketch-map.*
- France—Central.** *C.R.A. Sc. Paris 146* (1908) : 432-434. **Glangeaud.**  
Sur l'extension des dépressions oligocènes dans une partie du Massif central et sur leur rôle au point de vue hydrologique. Par Ph. Glangeaud. *Sketch-map.*

- France—Central.** *Ann. G. 16* (1907): 296-308, 399-413. **Gallois.**  
Excursion géographique interuniversitaire autour de Paris et dans le Morvan. Par L. Gallois. *Illustrations.*
- France, Central—Anthropogeography.** **Boyer and others.**  
Les populations forestières du centre de la France; Morvand, Bas Nivernais, Puisaye. Par A. Boyer, E. Demolins, le Cte. de Damas d'Anlezy, et P. Descamps. (Bibliothèque de la science sociale.) Paris: Bureaux de la Science Sociale, 1907. Size 10 × 6½, pp. 86.  
See note in the Monthly Record, ante.
- France—Finistère.** *B.I. Océanogr. Monaco 111* (1908): pp. 30. **Legendre.**  
Recherches océanographiques faites dans la région littorale de Concarneau pendant l'été de 1907. Par R. Legendre. *Diagrams.*
- France—North-East.** **Chantriot.**  
*B.S.G. de l'Est 27* (1906): 273-300, 399-422; **28** (1907): 31-41, 147-160, 277-292.  
Les cartes anciennes de la Champagne. Par Emile Chantriot.
- France—Population.**  
République Française; Direction du travail. Service du recensement. Album graphique de la statistique générale de la France. Paris, 1907. Size 11 × 9, pp. viii. and 280. *Maps and Diagrams.*  
A number of sketch-maps illustrate graphically the various distributions of population, etc., according to the census of 1901.
- France—Savoie.** *B.S. Neuchatel. G. 18* (1907): 75-87. **Girardin.**  
Le glacier de Bézin en Maurienne. Contribution à l'étude de l'érosion glaciaire. Par Paul Girardin. *Sketch-maps and Illustrations.*
- France—South.** *Ann. G. 16* (1907): 414-429. **Sorre.**  
La plaine du Bas-Languedoc. Etude de géographie humaine par Maximilien Sorre. *Sketch-maps.*  
See note in the May number, p. 563.
- France—Water-power.**  
Ministère de l'Agriculture. Annales: Direction de l'hydraulique et des améliorations agricoles. Fascicule 32. Service d'études des grandes forces hydrauliques (région des Alpes). Tome 2. Paris, 1905. Size 11 × 7, pp. 452. *Maps and Diag.*
- French Colonies.** **Lister.**  
France, No. 1 (1908). Report by the Hon. Reginald Lister, His Majesty's Minister at Paris, upon the French Colonies. London: Wyman & Sons. Size 13 × 8½, pp. 68. Price 7d.
- Germany—Bavaria.** *M.G. Ges. München 2* (1907): 93-196. **Breu.**  
Der Tegernsee, eine limnologische Studie. Von Georg Breu. *Maps and Sections.*
- Germany—Bavaria.** *Verhandl. XVI. Deuts. G.-tages, Nürnberg* (1907): 334-342. **Breu.**  
Neue Seestudien in Bayern. Von Georg Breu.
- Germany—Bavaria.** *Verhandl. XVI. G.-tages, Nürnberg* (1907): 147-177. **Müller.**  
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A visit to the Hangchow bore. By Dr. Charles Keyser Edmunds. *Maps and Illustrations.*

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Excursion through the districts of Sintzintin, Fin-khuan, and Liao-yang, in the Shentzin [Shing-king] province of Southern Manchuria. By J. C. Edelstein. *Map and Illustrations.*

The map shows the geological formations.

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Count de Lesdain's travels across Asia. By C. E. D. Black. *Map.*

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An archipelago of sand-dunes in a lake of Central Asia. By Ellsworth Huntington. *Map.*

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- New Guinea—Dutch.** *Ts. K. Nederland. Aardr. Genoots.* 25 (1908): 133-144. **Rouffaer.**  
 De terugkeer en afloop der Lorentz-expeditie naar centraal Ned. Nieuw-Guinea. Door G. P. Rouffaer. *Map.*  
 Noticed in the Monthly Record, April, p. 447.
- New Guinea—Dutch.** *Ts. K. Nederland. Aardr. Genoots.* 25 (1908): 122-125. **Palot.**  
 Is de Suopi aan Nieuw-Guinea's noordwestkust soms de bovenloop der Sëbjar, die uitmondt in de Maocluer-golf? Door A. Tissot v. Palot. *Sketch-map.*  
 Discusses the termination of the Suopi river.
- New Guinea—Ethnology.** **Pösch.**  
 Einige bemerkenswerte Ethnologika aus Neu-Guinea. Von Dr. Rudolf Pösch. (Separatabdruck aus Band xxxvii. der Mitteilungen der Anthropologischen Gesellschaft in Wien.) Vienna, 1907. Size 11 x 7½, pp. 57-71. *Illustrations.*
- New Guinea—German.** *Globus* 93 (1908): 139-143, 149-155, 169-173. **Pösch.**  
 Reisen an der Nordküste von Kaiser Wilhelmsland. Von Dr. Rudolf Pösch. *Sketch-map and Illustrations.*
- New South Wales—Geology.** **David.**  
 Memoirs of the Geological Survey of New South Wales. Geology, No. 4. The Geology of the Hunter River Coal-measures, New South Wales. By T. W. Edgeworth David. Part i. Sydney, 1907. Size 12 x 10, pp. xx. and 372. *Maps (in separate case, size 12½ x 10), Sections, and Illustrations.*
- New Zealand—Alps.** *Alpine J.* 24 (1908): 67-79. **Mannering.**  
 The Godley Glacier and Sealy Pass, New Zealand. By G. E. Mannering. *Map and Illustrations.*  
 Account of a journey in 1892 in a portion of the New Zealand Alps, which has since been little visited.
- New Zealand—Geology.** **Fraser and Adams.**  
*New Zealand Geol. Surv., B.* 4 (1907): pp. x. and 154.  
 The Geology of the Coromandel subdivision, Hauraki, Auckland. By Colin Fraser, assisted by James Henry Adams. *Maps and Illustrations.*
- Pacific Islands.** *Abregé B.S. Hongroise G.* 35 (1907): 180-186. **Vojnich.**  
 Reisen im Vulkangebiets Ozeaniens. Von Oskár Vojnich. (*Földrajzi Közlemények* 35 (1907): 446-453.) *Illustrations.*
- Pacific Ocean—Historical.** **Dahlgren.**  
 Voyages françaises à destination de la Mer du Sud avant Bougainville (1695-1749). Par E. W. Dahlgren. (Extrait des *Nouvelles Archives des Missions Scientifiques*, tome 14.) Paris, 1907. Size 9½ x 6½, pp. 423-568.
- Western Australia—Census.**  
 Seventh Census of Western Australia, taken for the night of March 31, 1901.

Compiled under the direction of Malcolm A. C. Fraser. 3 vols. Perth, 1904.  
Size 13 x 8. *Maps (forming vol. 3) and Diagrams.*

## POLAR REGIONS.

**Antarctic—Glaciation.** *La G., B.S.G. Paris* 16 (1907): 385-401. **Rabot.**

La glaciation antarctique, d'après les observations des récentes expéditions. Par Charles Rabot. *Illustrations.*

**Arctic.** **Isachsen.**

Plan for en ny polar ekspedition. Af Gunnar Isachsen. [Christiania, 1908.]  
Size 9½ x 6½, pp. 4. *Map.*

**Arctic—Bennett Island.** *B. Imp. Russ. G.S.* 42 (1906): 487-519. **Kolchak.**

The last expedition to Bennett Island, sent by the Academy of Sciences in search of Baron Toll. By A. Kolchak. *Illustrations.* [In Russian.]

**Arctic Ocean.**

Meteorological and Hydrographical Observations made during the summer of 1905 on the steamship *Pakhtusof* in the Arctic Ocean. Publication of the Chief Hydrographical Department. St. Petersburg, 1907. Size 11 x 8½, pp. vi. and 90. [In Russian.]

**Arctic Ocean.** *B.I. Oceanogr. Monaco* 112 (1908): pp. 22. **Richard.**

Observations de température des eaux marines arctiques faites pendant les campagnes du yacht *Princesse-Alice* (1906-07). Par le Dr. Jules Richard. *Maps.*

**Arctic Ocean—Ice.** *B.I. Oceanogr. Monaco* 114 (1908): pp. 8. **Isachsen.**

Les glaces autour de Spitsbergen en 1907. Par Gunnar Isachsen. *Map.*

**Arctic Ocean—Ice.** *Norske G.S. Aarbog* 18 (1906-07): 119-125. **Isachsen.**

Isforholdene omkring Spitsbergen, 1907. Af Gunnar Isachsen. *Map.*

**Arctic Ocean—Ice.**

**Garde.**

The state of the ice in the Arctic seas, 1907. Prepared by V. Garde. [Copenhagen, 1908.] Size 12 x 9½, pp. 18. *Map.*

The popular impression of the generally unfavourable character of 1907 as regards Arctic ice is only partially justified.

**Arctic Ocean—Seals.** **Hjort and Knipovich.**

*Conseil Explor. de la Mer, Rapports et P.-V.* 8 (1907): pp. 126.

Bericht über die Lebensverhältnisse und den Fang der nordischen Seehunde. Erstattet von Dr. Joh. Hjort und Dr. N. Knipowitsch. *Maps and Illustrations.*

**Arctic—Spitsbergen.** *Norske G.S. Aarbog* 18 (1906-07): 87-118. **Isachsen.**

Spitsbergenekspeditionen, 1906. Af Gunnar Isachsen. *Maps and Illustrations.*

This expedition was briefly described in vol. 29, p. 462.

**Greenland—Disko Island.** *G. Ts., Copenhagen* 19 (1907-08): 70-78. **Porsild.**

Foreløbig Beretning om Rejsningen af den danske arktiske Station. Af Morten P. Porsild.

**Polar Regions.** *G.Z.* 13 (1907): 465-478, 557-568, 614-627, 676-687. **Nordenskjöld.**

Ueber die Natur der Polarländer. Von Otto Nordenskjöld.

**Polar Regions—Climate.** *Rev. G. Col. y Mercantil, Madrid* 5 (1908): 14-19. **Sobral.**

Cambio de clima en las regiones polares. Por José G. Sobral.

**Spitsbergen—Geodesy.** *Ymer* 27 (1907): 375-407. **Carlheim-Gyllensköld.**

Svenska gradmätningsexpeditionen fysikaliska, meteorologiska och naturhistoriska arbeten. Af V. Carlheim-Gyllensköld. *Illustrations.*

## MATHEMATICAL GEOGRAPHY.

**Cartography—Scales.** **Pollacchi.**

Les échelles métriques des cartes géographiques, topographiques et marines; et règle graduée, supprimant les calculs de ces échelles. Par le Capt. P. Pollacchi. Paris: R. Chapelot et Cie., 1907. Size 8½ x 5½, pp. 32. Price 1s. 3d.

- Measurement of Distances.** *Deutsche Rundschau* G. 30 (1908): 148-151. **Habenicht.**  
 Das Velometer, ein verbesserter Entfernungsmesser. Von H. Habenicht. *Illustr.*  
 The machine is a specially arranged bicycle with cyclometer.
- Sextant-Observations.** *Ann. Hydrographie* 36 (1908): 75-83. **Müller.**  
 Ueber die Verwendung von Sterndistanzen zur Bestimmung der Sextantenfehler auf See. Von Dr. Johannes Müller. *Diagrams.*
- Surveying.** *P.I. Civil Engineers* 170 (1907): 315-323. **Cuffe.**  
 Survey of inaccessible places by tacheometry. By O. F. L. W. Cuffe. *Sketch-maps and Illustrations.*

### PHYSICAL AND BIOLOGICAL GEOGRAPHY.

- Climatology.** *G.Z.* 13 (1907): 688-694. **Schubert.**  
 Landsee und Wald als Klimatische Faktoren. Von J. Schubert. *Diagram.*
- Climatology.** **Du Faur.**  
 The effect of polar ice on the weather. By E. Du Faur. (From the *Journal and Proceedings of the Royal Society of New South Wales*, vol. 41.) [Sydney, 1908.] Size  $8\frac{1}{2} \times 5\frac{1}{2}$  pp. 176-189. *Facsimile Map and Illustrations.*
- Earthquakes and Architecture.** *An. S. Cient. Argentina* 84 (1907): 5-87. **Selva.**  
 Edificación contra trembores. Por Domingo Selva. *Illustrations.*
- Geomorphology—Rivers.** *Geol. Mag.*, Dec. V. 5 (1908): 108-112. **Ellis.**  
 Windings of rivers. By T. S. Ellis. *Sketch-maps.*
- Geophysics.** *Atti R.A. Lincei, Rendiconti* 16 (1907): 2 Sem. 910-916. **Marchi.**  
 La teoria elastica dell' isostasi terrestre. Di Luigi de Marchi.
- Ice-forms.** *Z. Ges. E. Berlin*, 1908: 95-115. **Hauthal and others.**  
 Die Schmelzformen des Firns im tropischen und subtropischen Hochgebirge. Von Dr. R. Hauthal, Prof. Dr. Hans Meyer, Dr. Fritz Jaeger u.a. *Illustrations.*  
 See note in the April number (p. 449).
- Limnology.** *Verhandl. XVI. Deuts. G.-tages, Nürnberg* (1907): 319-333. **Halbfass.**  
 Inwieweit kann die Seenkunde die Lösung Klimatologischer Probleme fördern? Von Prof. Dr. W. Halbfass.
- Meteorology.** **Arctowski.**  
 Recherches sur la périodicité des phénomènes météorologiques à Bruxelles. Notice sur les variations de longue durée des amplitudes moyennes de la marche diurne de la température en Russie. Variation des amplitudes des marches diurnes de la température au sommet du Pike's Peak. Par Henryk Arctowski. (Extrait du "Bulletin de la Société Belge d'Astronomie," Année 1908.) Brussels, [1908]. Size  $9\frac{1}{2} \times 6\frac{1}{2}$  pp. 36. *Diagrams.*
- Meteorology.** **Arctowski.**  
 Variations de longue durée de divers phénomènes atmosphériques. Par Henryk Arctowski. (Extrait du no. 11, 1907, du "Bulletin de la Société belge d'Astronomie.") Brussels, [1907]. Size  $9\frac{1}{2} \times 6\frac{1}{2}$  pp. 14. *Diagrams.*
- Meteorology—Anti-trades.** *Ann. G.* 17 (1908): 1-16. **Brunhes.**  
 Le contre-alizé. Par Bernard Brunhes. *Diagram.*
- Meteorology—Circulation.** **Arctowski.**  
 De l'influence de la lune sur la vitesse du vent aux sommets du Saentis, du Sonnbliek et du Pike's Peak. Par Henryk Arctowski. (Extrait du no. 12, 1907, du "Bulletin de la Société Belge d'Astronomie.") Brussels, [1907]. Size  $9\frac{1}{2} \times 6\frac{1}{2}$  pp. 14. *Diagrams.*
- Meteorology—Clouds.** **Leyst.**  
 Ueber Schätzung der Bewölkungsgrade. Von Prof. Dr. Ernst Leyst. [From *Bulletin des Naturalistes de Moscou*, Nos. 3 and 4, 1906.] Moscow, 1906. Size  $10 \times 6\frac{1}{2}$  pp. 217-269.
- Meteorology—Precipitation.** *M. k.k. G. Ges. Wien* 50 (1907): 139-164. **Kerner.**  
 Revision der zonaren Niederschlagsverteilung. Von Dr. Fritz v. Kerner.
- Meteorology—Pressure.** *Ann. Hydrographie* 35 (1907): 496-500. **Baschin.**  
 Die Verteilung des Luftdrucks über den Ozeanen. Von Otto Baschin.

**Meteorology—Solar Radiation.**

Newcomb.

*T. American Philosophical S.* 21 (1908): 809-887.

A search for fluctuations in the sun's thermal radiation through their influence on terrestrial temperature. By Simon Newcomb.

**Meteorology—Spectre of the Brocken.** *Meteorologische Z.* 25 (1908): 19-25. Richards.

Ueber Beobachtungen des künstlichen Brockengeespenstes. Von F. Richards. *Diagrams.*

**Meteorology—Upper Atmosphere.** *Ann. Hydrographie* 36 (1908): 63-66. Schlénka.

Fesselballonaufstiege für meteorologische Höhenforschung an Bord S.M.S. *Planet.* Von Oberleutnant Schlenzka. *Illustrations.*

**Oceanography—Arctic Ocean.** *B.S.R. Belge G.* 31 (1907): 462-467. Denucé.

La seconde expédition polaire allemande, 1869-1870. Une liste inédite de sondages d'eau de mer profonde, du Capitaine Hegemann. Par J. Denucé.

**Oceanography—Arctic Ocean.**

Polilloff.

Sketch of the work of the hydrographical expedition to the northern polar ocean, in its meteorological, hydrographical, and medical aspects. By D. Polilloff. (Supplement to 'Memoirs on Hydrography,' vol. 27.) St. Petersburg, 1906. Size 10½ x 7, pp. 132. *Map.* [In Russian.]

**Oceanography—Atlantic.** *Petermanns M.* 54 (1908): 16-19. Schott.

Salzgehalt und Dichte der Meeresoberfläche in den westindischen Gewässern. Von Prof. Dr. Gerhard Schott. *Maps.*

**Oceanography—Atlantic.**

Nielsen.

*Meddelelser Kom. Havundersøgeiser, Copenhagen; Hydrograaf* 1 (1907): No. 9, pp. 26.

Contribution to the hydrography of the north-eastern part of the Atlantic Ocean. By J. N. Nielsen. *Map and Sections.*

**Oceanography—Baltic.**

*Conseil Explor. de la Mer; Rapports et P.-V.* 9 (1908): pp. 120.

Bericht über die Tätigkeit der Kommission C. 1. (Geschäftsführer Dr. Filip Trybner) in der Periode Februar 1903—Juli 1907. *Map.*

On investigations into the life-conditions and migrations of fish.

**Oceanography—Baltic—Currents.**

Pettersson.

Strömstudier vid Östersjöns portar. Af O. Pettersson. [German *résumé.*] Göteborg, 1908. Size 18 x 12½, pp. 16 and x. *Sketch-map, Sections, and Illustrations.* Presented by the Author.

**Oceanography—North Atlantic.**

Hjort.

Some results of the International ocean research. By Dr. Johan Hjort. Edinburgh: The Scottish Oceanographical Laboratory, 1908. Size 10 x 6, pp. 40. *Sketch-maps, Illustrations, and Diagrams.* Price 1s. Presented by the Publishers.

**Oceanography—North Atlantic.** *Ann. Hydrographie* 35 (1907): 506-513. Brennecke.

Die dänischen hydrographischen Untersuchungen im Nordatlantischen Ozean, 1903-1905. Von Dr. W. Brennecke. *Map and Sections.*

**Oceanography—North Sea.** *Ann. Hydrographie* 36 (1908): 1-5.

Perlewitz.

Ozeanographische Versuche und Beobachtungen an Bord S.M.G. *Müne* und S.M.S. *Zieten* im Sommer 1907. Im amtlichen Auftrage von Dr. P. Perlewitz. *Diagram.*

**Oceanography—Red Sea.**

Crossland, Herdman, and others.

*J. Linnean S., Zoology*, 31 (1907): 1-44.

Reports on the marine biology of the Sudanese Red sea, from collections made by Cyril Crossland. With an introduction by Dr. W. A. Herdman. *Map and Illustrations.*

Mr. Crossland supplies a narrative of the expedition, and discusses the shore-cliff near Alexandria, and the recent history of coral reefs in the Red sea (*cf.* vol. 31, p. 566).

**Seismology.**

Eudolph and Tams.

Seismogramme des nordpazifischen und südamerikanischen Erdbebens am 16. August, 1906. Auf Beschluss der Permanenten Kommission der Internationalen Seismologischen Assoziation herausgegeben. . . . [Reproductions of 58 seismograms, in case, 18 x 13.] Begleitworte und Erläuterungen, von E. Rudolph and E. Tams. Size 11 x 7, pp. 98. *Map.* Strassburg, 1907. Presented by the Association through Major L. Darwin.

No. I.—JULY, 1908.]

I

- Seismology.** *Nineteenth Century* 63 (1908): 144-150. Gill.  
Some recent earthquake theories. By Rev. H. V. Gill.
- Seismology.** Rosenthal.  
Veröffentlichungen des Zentralbureau des Internationalen Seismologischen Assoziation, Serie B. Katalog der im Jahre 1904 registrierten seismischen Störungen. Zusammengestellt von Elmar Rosenthal. Strassburg, 1907. Size 11 x 7½, pp. xii. and 146. Presented by the Association through Major L. Darwin.
- Volcanoes.** Brun.  
Quelques recherches sur le volcanisme. Par Albert Brun. 2 parts. (Extraits des Archives des Sciences physiques et naturelles, mai et juin, 1905, et Novembre, 1906.) [Geneva, 1905-06.] Size 9 x 6, pp (part i.) 80; (part ii.) 24. Illustrations.

## ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

- Anthropogeography.**  
Geography and architecture. (From the *Building News*, London, October 4, 1907.) Size 12¼ x 8½, p. 449. [1 sheet.]  
Noticed in the May number (p. 571).
- Anthropogeography.** B. *American G.S.* 40 (1908): 7-11. Ward.  
Some problems of the tropics. By Robert De C. Ward.  
On various questions bearing on the economic development of tropical regions.
- Anthropogeography.** B. *Imp. Russ. G.S.* 42 (1906): 649-782. Voelkof.  
The distribution of population over the Earth's surface in its relation to natural conditions and commercial activity. By A. J. Voelkof. *Maps and Diagram.* [In Russian.]
- Anthropogeography.** Schlüter.  
*Verhandl. XVI. Deuts. G.-tages, Nürnberg* (1907): 304-318.  
Ueber des Verhältnis von Natur und Mensch in der Anthropogeographie. Von Dr. Otto Schlüter.
- Anthropogeography.** Hettner.  
*Verhandl. XVI. Deuts. G.-tages, Nürnberg* (1907): 273-303.  
Die Geographie des Menschen. Von Prof. Dr. Alfred Hettner.
- Anthropogeography.** B.S. *Neuchâtel. G.* 18 (1907): 166-183. Clerget.  
Introduction géographique à l'étude de l'économie politique. Par Pierre Clerget.
- Anthropogeography—Population.** G.Z. 13 (1907): 657-676. Voelkof.  
Die natürliche Vermehrung der Bevölkerung, ihre geographische Verteilung, Vergangenheit und Zukunft. Von Alexander Woelkow. *Maps.*
- Anthropogeography—Towns.** Oberhummer.  
*Verhandl. XVI. Deuts. G.-tages, Nürnberg* (1907): 66-101.  
Der Stadtplan, seine Entwicklung und geographische Bedeutung. Von Prof. Dr. Eugen Oberhummer. *Facsimile plans.*
- Commercial.** Angus.  
*Scottish G. Mag.* 24 (1908): 133-141.  
The geographical distribution of labour. By H. Crawford Angus.
- Commercial.** Chisholm.  
*Scottish G. Mag.* 24 (1908): 113-132.  
Economic geography. By George G. Chisholm. *Portrait, Maps, and Diagrams.*
- Commercial—Mines.**  
Mines and Quarries: General Report and Statistics for 1905. London, 1906-1907. Size 13 x 8½, pp. 498. *Map and Diagrams.* Presented by the Home Office.
- Commercial—Rubber.** Wildeman.  
*B.S.G. de l'Est* 28 (1907): 428-447.  
La géographie du caoutchouc et son exploitation. Par E. de Wildeman.
- Historical.** Niermeyer.  
*Ts. K. Nederland. Aard. Genoots.* 25 (1908): 125-133.  
Dapper en Montanus. Door J. F. Niermeyer.  
A trenchant criticism of the strange theory put forward by Mr. Schuller (*Journal*, vol. 30, p. 568).

**Historical—Early Voyages.** *Norske G.S. Aarbog* 18 (1906-07): 20-32. **Isachsen.**  
 Nordboernes faerder til Norderseta. Af G. Isachsen. *Maps.*

The writer thinks that traces of the early voyages of the Northmen were found by the second *Fram* Expedition in the Arctic archipelago. (Of *Journal*, vol. 26, p. 120.)

**Historical—Indian Ocean.** *J. Asiatique*, Ser. X. 10 (1907): 433-566. **Ferrand.**  
 Les îles Râmy, Lâmy, Wâkwâk, Komor des géographes arabes, et Madagascar.  
 Par Gabriel Ferrand.

**Historical—Norwegian voyage.** *Norske G.S. Aarbog* 18 (1906-07): 1-29. **Isachsen.**  
 Om opdagelsen af Svalbard. Af G. Isachsen. Size 10 × 6½. *Map. Also separate copy.*

Svalbard was a northern land said to have been discovered in 1194.

**Historical—Voyages.** *B.S.G. Com. Havre* 24 (1907): 281-329. **Moulin.**  
 Aventures des Marins Dieppois. Histoire des découvertes maritimes, des exploits militaires, des travaux scientifiques, des sauvetages dus aux navigateurs de Dieppe.  
 Par Alfred Moulin. *Sketch-maps.*

**History of Geography.** *Norske G.S. Aarbog* 18 (1906-07): 71-86. **Jacobsen.**  
 Et afsnit af geografiens historie, 1800-1830. Af Birger Jacobsen.

### BIOGRAPHY.

**Lopez.** **Marcel.**  
 Le géographe Thomas Lopez et son œuvre: essai de biographie et de cartographie.  
 Par Gabriel Marcel. (Extrait de la *Revue Hispanique*, tome 16.) New York, etc., 1907. Size 10 × 6½, pp. 114. *Presented by the Author.*  
 On the work of this Spanish cartographer (eighteenth and nineteenth centuries).

**Oscar II.** *Ymer* 27 (1907): 307-313. **Nathorst.**  
 Konung Oscar II. och den geografiska forskningen. Af A. G. Nathorst. *Also separate copy.*

**Scherer.** *M.G. Ges. München* 2 (1907): 1-40. **Sandler.**  
 Ein bayerischer Jesuitengeograph. Von Chr. Sandler. *Facsimile Maps and Illustrations.*  
 Heinrich Scherer, the subject of this memoir, was born in 1628.

**Scherzer.**  
 Dr. Karl Ritter von Scherzer. Eine biographische Skizze herausgegeben vom Komitee zur Errichtung eines Dr. Karl Ritter von Scherzer-Denkmales in Wien. Vienna, 1907. Size 8 × 5½, pp. 32. *Portrait.*

### GENERAL.

**Alpine Club.** *Alpine J.* 24 (1908): 15-29. **Pilkington.**  
 Fifty years of the Alpine Club. By Charles Pilkington.

**Educational.** **Jefferson.**  
 World diagrams of population, temperatures, rainfall, and plant distribution. A Supplement to 'Teacher's Geography.' By Mark Jefferson. Ypsilanti, Mich., 1908. Size 10½ × 8, pp. 57-82. *Maps.*

The diagrams here reproduced, with notes, have been used by the writer in his educational courses.

**Educational.**  
 Board of Education. Suggestions for the consideration of teachers and others concerned in the work of Public Elementary Schools. London, 1905. Size 9½ × 6, pp. 156.

There are some excellent hints on the teaching of geography.

**Educational.** *J.G.* 6 (1907): 145-150. **Brown.**  
 An experiment on the size of the Earth. By Robert Marshall Brown. *Sketch-map and Diagrams.*

On a practical method of determining the size of the Earth for educational purposes.

- Geographical Knowledge.** *Contemporary Rev.* 83 (1908): 171-181. Walpole.  
The growth of the world. By the late Sir Spencer Walpole.  
On the gradual enlargement of the known world.
- Geography.** *Verhandl. XVI. Deuts. G.-tages, Nürnberg* (1907): 51-65. Tiessen.  
Beobachtende Geographie und Länderkunde in ihrer neueren Entwicklung,  
nebst einem Wort zum 25-jährigen Bestehen der Zentralkommission für wissen-  
schaftliche Landeskunde von Deutschland. Von Dr. E. Tiessen.
- German Colonies.**  
Jahresbericht über die Entwicklung der Schutzgebiete in Afrika und der Südsee  
im Jahre 1906-07. (Beilage zum Deutschen Kolonialblatt, 1908.) 8 parts and  
"Anhang." Berlin, 1908. Size 12 x 9. *Sketch-maps, Illustrations, and Diagrams.*
- German Colonies—Surveys.** *Z. Kolonialpolitik* 10 (1908): 15-25. Kohlshütter.  
Koloniale Landvermessung. Von Dr. E. Kohlshütter.

## NEW MAPS.

By E. A. REEVES, Map Curator, R.G.S.

## EUROPE.

- Austria—Vienna.** Rothaug.  
Karte der Umgebung von Wien. Bearbeitet von J. G. Rothaug. Scale 1:30,000  
or 2.1 inches to a stat. mile. 6 sheets. Vienna: G. Freytag & Berndt, [1908].  
*Presented by the Publishers.*

A large wall-map of the environs of Vienna coloured on the stereoscopic system,  
similarly with other maps lately published by Messrs. Freytag & Berndt. The high  
lands stand out well in relief, but the colouring for the lowlying districts is not quite  
so successful. Contour-lines at intervals of 20 metres can be clearly followed upon  
close inspection.

- British Isles—England and Wales.** Ordnance Survey.  
Sheets published by the Director-General of the Ordnance Survey, Southampton,  
from May 1 to 30, 1908.

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S.E., 56 N.E., S.W., S.E. **Lancashire** (First Revision of 1891 Survey), 108 S.W., 111  
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(Second Revision), V. 11; XII. 14; XX. 3, 7, 11; XXXII. 2, 3; LII. 6, 7, 8, 10,  
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1. 1s. 6d. each. **Lancashire** (First Revision of 1891 Survey), C. 2, 3, 4, 7, 8, 9,  
10, 16; CIII. 5, 9, 13, 14, 15, 16; CIV. 11, 12, 14, 15; CVI. 11, 16; CVII. 4, 6, 7,  
8; OX. 1, 2, 3; CXIII. 7, 8. **Pembrokeshire** (First Revision), XXIII. 16;  
XXXIX. 3, 14; XL. 10; XLII. 1, 2, 4, 5, 6, 7, 8, 9, (10 and 14), 12, (14 and 10),  
(16 and part of 15); XLIII. 2, 5, 6, 10. **Yorkshire** (First Revision of 1891  
Survey), CCIII. 4; CCIV. 6, 7, 11, 12, 14, 15, 16; CCV. 1, 2, 3, 4, 7, 11; CCVI.  
2, 5, 6, 9, 10, 13, 15; CCXV. 1, 2; CCXVI. 7, 13, 14, 15, 16; CCXVII. 6, 7, 9, 10,  
11, 12, 13, 14, 15; CCXXXII. 1, 2; CCXXXIII. 2, 4.

E. Stanford, London Agent.

**British Islands—England and Wales.****Geological Survey.**

4 miles to 1 inch:—

New Series, printed in colours. Solid edition. Sheet 14, Aberystwyth, Carmarthen, Hereford, etc. *Price 2s. 6d.*

(*E. Stanford, London Agent.*)

**British Isles—England and Wales.****Royal Commission on Canals and Waterways.**

Map of the Canals and Navigable Rivers in the catchment basins of England and Wales. Scale 1:633,600 or 1 inch to 10 stat. miles. 2 sheets.—Map of the Canal Systems and Navigable Rivers of England and Wales, showing railway owned, railway controlled, and independent canal systems and tidal working of navigable rivers. Scale 1:633,600 or 1 inch to 10 stat. miles. 2 sheets. London: Royal Commission on Canals and Waterways, 1908. *Presented by the Royal Commission on Canals and Waterways.*

Two maps, with indexes, recently prepared for the report of the Royal Commission on Canals and Waterways. The first (Plate No. 4) shows the canals comprised in one system by the same colour, and adjoining systems in different colours. Derelict canals and canals converted into, or sites used for, railways are shown by different symbols. Catchment basins are clearly indicated by colour-tinting. This map has been finally revised and corrected, and is intended to take the place of the earlier edition previously issued.

The second map (Plate No. 5) is entirely new, and shows canals and waterways of the country arranged according to their ownership and relative widths. Both maps are in two sheets, and consist of a faintly printed outline impression of the 10-miles-to-an-inch Ordnance Survey map of England and Wales, with the special information superimposed boldly in colour.

**British Isles—Scotland.****Bartholomew.**

Pedestrians' map of Edinburgh district and Pentland Hills. By John Bartholomew, F.R.G.S. Scale 1:15,840 or 4 inches to 1 stat. mile. Edinburgh: John Bartholomew & Co., [1908]. *Price, mounted in cloth, 2s. net. Presented by the Publisher.*

Shows height of land by colour-tinting and contours, in Messrs. Bartholomew's well-known clear style.

**France.****Ministre de l'Intérieur, Paris.**

Carte de la France dressée par ordre du Ministre de l'Intérieur. Scale 1:100,000 or 1 inch to 1·6 stat. miles. Sheets: III.—15, Brest; XIII.—17, St. Calais; XIV.—18, Blois (Ouest); XVI.—18, Paris (Ouest); XVII.—29, Aurillac; XVII.—34, Laçonne; XIX.—21, Decize; XIX.—33, Le Vigan; XX.—16, Ervy; XX.—20, Château-Chinon; XX.—26, Montbrison; XX.—33, St. Hippolyte-du-Fort; XXI.—23, Mâcon (Ouest); XXI.—28, Tournon. Paris: Ministère de l'Intérieur, 1907–08. *Price 0.80 fr. each sheet.*

These are new editions.

**France.****Service Géographique de l'Armée, Paris.**

Carte des Chemins de Fer Français. Scale 1:800,000 or 1 inch to 12·6 stat. miles, 4 sheets. Paris: Service Géographique de l'Armée, 1907. *Price 1.50 fr. each sheet.*

**Norway.****Norges Geografiske Opmaalning.**

Topografisk kart over kongeriget Norge. Scale 1:100,000 or 1 inch to 1·6 stat. mile. Sheets: L. 9, Lødingen; T. 5, Kaaffjord.—Kristiania Omegen. Scale 1:25,000 or 2·5 inches to 1 stat. mile. Sheet iv. Christiania: Norges Geografiske Opmaalning, 1907–08. *Presented by the Norwegian Geographical Institute.*

**ASIA.****Malay Archipelago.****Topographische Inrichting, Batavia.**

Overzichtskaart van den Oost-Indischen Archipel. Scale 1:2,500,000 or 1 inch to 39·5 stat. miles. 6 sheets. Batavia: Topographische Inrichting, 1908.

A good general map of the East Indian archipelago, well drawn, and carefully printed in colours. It is important as showing, as far as the scale will admit without overcrowding, the results of the latest explorations and surveys in the Netherland possessions. An index of place-names accompanies the map as a separate pamphlet, which will be useful for reference.

**AFRICA.****Cape Colony.****Cape Geological Commission.**

Geological map of the Colony of the Cape of Good Hope. Scale 1:328,000 or 1

inch to 3·7 stat. miles. Sheets: 49, Kuruman; 50, Vryburg. Cape Town: Geological Commission, 1908. *Price 2s. 6d. each sheet. Presented by the Director, Geological Survey of the Cape of Good Hope.*

These are two adjoining sheets, extending westward from the Transvaal boundary to the Kuruman river, and from lat. 26° 30' to 27° 40' S. The geological features are well shown in colours, and useful sections are given on the borders of the sheets.

#### Egypt.

Survey Department, Cairo.

Topographical Map of Egypt. Scale 1:50,000 or 1·3 inch to 1 stat. mile. Sheets: n.w. II.-I. s.w. IX.-I., IX.-II.—Topographical map of Qaliubia Province. Scale 1:10,000 or 6·3 inches to 1 stat. mile. Sheets: n.e. 9-4, 9-6, 10-4, 10-5, 10-6, 11-4. Cairo: Survey Department, 1908. *Presented by the Director-General, Survey Department, Cairo.*

#### Gold Coast.

Guggisberg.

Map of the Gold Coast. Published by the authority of Sir John Pickersgill Rodger, K.C.M.G., Governor, under the direction of Major F. G. Guggisberg, R.N., F.R.G.S., Director of Surveys, Gold Coast. Scale 1:125,000 or 1 inch to 1·9 stat. mile. Sheets: 73-G-I., Wupe; 73-G-III. Akuse. Edinburgh and London: W. & A. K. Johnston, Ltd., 1908. *Price 2s. each sheet. Presented by Major F. G. Guggisberg, R.E., Director of Surveys, Gold Coast.*

These two sheets show the course of the Volta and the country immediately to the east from lat. 6° N. to 6° 45' N.

### AMERICA.

#### Canada.

Department of the Interior, Ottawa.

Standard Topographical Map of Canada. Scale 1:250,000 or 1 inch to 8·9 stat. miles. Sheet 2 s.w. and part of 9 s.w., Toronto and Muskoka. Ottawa: Department of the Interior, 1907. *Presented by James White, Esq., Geographer, Department of the Interior, Ottawa.*

#### Canada.

Dept. of the Interior, Ottawa.

Railway map of the Dominion of Canada. Scale 1:2,217,600 or 1 inch to 35 stat. miles. 8 sheets. Ottawa: Department of the Interior, 1907. *Presented by James White, Esq., Geographer, Department of the Interior, Ottawa.*

A large-scale map of the Dominion of Canada printed in colours, without hill shading, upon which most complete information is given concerning railways, by means of various colours and symbols. Lines projected and under construction are clearly distinguished from working lines. Several useful tables appear on the map, one of the distances in miles from Montreal, Winnipeg, and Vancouver to important places in Canada; another gives the names of the different railways, each with a reference number corresponding to that affixed to the line on the map; whilst a third gives the mileage of lines completed and under construction, rolling stock, receipts for 1905-06, cost of maintenance and operation, 1905-06, and the total cost. This map is most important to all interested in the development of the Dominion, and it is evident that Mr. J. White has spared no pains to make it as complete as possible.

### AUSTRALASIA.

#### Australasia.

Mackinder.

Stanford's new orographical map of Australasia. Compiled under the direction of H. J. Mackinder, M.A. Scale 1:5,385,600 or 1 inch to 85 stat. miles. 4 sheets. London: Edward Stanford, 1908. *Price 16s. Presented by the Publisher.*

This map, like those of the same series previously published, shows land elevation by shades of brown and ocean depths in blue, the intervals in feet both for land and water being: sea-level to 500, 500-1000, 1000-5000, 5000-10,000, 10,000-15,000, and over 15,000. In many regions the contours can only be very approximate, as no accurate surveys exist upon which they could be based; still the map gives a very good general idea of the physical features of this part of the world as regards elevations and depressions. Political frontiers have been indicated by dotted grey lines, in which colour also the place-names are printed, so that the general effect of the tinting is not obscured.

## GENERAL.

## World.

Reich.

**Atlas Antiquus.** By Emil Reich. London: Macmillan & Co., 1908. Price 10s. *not. Presented by the Publishers.*

This atlas consists in the main of a series of forty-eight outline maps, upon which are shown, in colours, the routes of all the important military expeditions by land and sea in the Mediterranean countries from Italy to Asia Minor, previous to the times of the Roman emperors. But it is not limited to Greece, Italy, and the Mediterranean shores, for there are, amongst others, maps showing the expeditions of Alexander the Great and the Roman Empire at its greatest extent. Much information is ingeniously given on the maps without overcrowding by means of clearly distinguished symbols; for instance, as regards sites of battles, + denotes "beaten by," the initial of the defeated preceding that of the victor, thus D + S = Demetrius beaten by Seleucus, as in Map XX. Each map is preceded by a page or two of concisely written notes referring to the principal events dealt with on the map. Altogether Dr. E. Reich's 'Atlas Antiquus' is a most instructive volume, and in its design differs in several respects from most historical atlases. It has been prepared on the same lines as the author's New Atlas of English History, which was published in 1908, and its chief purpose is to project historical events graphically upon the territory in which they happened, and by the configuration of which they were largely influenced. Dr. Reich states that many of the military movements indicated in the maps are not in full accordance with all the sources, but where these are very contradictory he has formed his own opinion of what was most probably the truth.

## CHARTS.

## Admiralty Charts.

Hydrographic Department, Admiralty.

Charts and Plans published by the Hydrographic Department, Admiralty, during April, 1908. *Presented by the Hydrographer, Admiralty.*

## New Charts.

No.	Inches.	
2150 m	0·24	Germany, north coast:—Giedser Odde to Bornholm. 3s.
3677 m	29·0	Italy:—Port Savona. 2s.
3675 m	9·5	Plans on the east shore of the Adriatic:—Port Gravosa and Ombla inlet. 2s.
3691 m	7·2	Crete:—Suda bay anchorage. 2s.
3687 m	0·9	Tasmania:—Albatross island to Circular head. 3s.

## New Plans and Plans added.

2281 m	5·6	Norway. The Naze to Karmö. New Plan:—Port Stavanger. 3s.
2859 m	{ 8·8 10·0 }	Plans on the south coast of San Domingo. New Plan:—Barahona harbour. Plan added:—Port Viejo de Azua. 2s.
1316 m	3·1	Korea:—Cape Duroch to Linden point. Plan added:—Ohonjin or Chung Chin bay. 3s.

## Charts Cancelled.

No.		Cancelled by	No.
2150	Germany, north coast:—Fehmarn to Bornholm.	New chart. Giedser Odde to Bornholm . . . . .	2150
157	Italy:—San Remo to Cape Cavallo. Plan of Savona on this sheet.	New Chart. Port Savona . . . . .	3677
2713	Adriatic:—Cursola to Cattaro. Plan of Port Gravosa on this sheet.	New chart. Plans on the east shore of the Adriatic:—Port Gravosa and Ombla inlet . . . . .	3675
2172	Alaska:—Bering strait.	— — — — —	—

## Charts that have received Important Corrections.

No. 2586, Scotland:—Coastguard stations. 2587, Ireland Coastguard stations. 2297, Gulf of Bothnia:—Hangö head to South Quarken. 810, Gulf of Finland:—Hangö road and approaches. 870, Gulf of Finland:—Wormsö sound. 2227, Gulf of Finland:—Revel roadstead. 173, Gulf of Finland: Approaches to Helsingfors and Sveaborg. 2224, Gulf of Finland:—Helsingfors, Sveaborg, and parts adjacent. 2247, Gulf of Finland:—Hogland to Seskär, north shore. 2245, Gulf of Finland:—Hogland to Seskär, south shore. 74, Spain, north coast:—Portugalete and Bilbao. 157, Italy:—San Remo to Cape Cavallo. 243, Africa,

north coast :—Port of Alexandria. 3119, Africa, north coast :—Alexandria harbour. 1315, Bermuda :—The Narrows. 863, Labrador :—Hudson bay and strait. 293, Newfoundland :—Gander bay to Cape Bonavista. 761, West India islands and Caribbean sea, sheet I. 762, West India islands and Caribbean sea, sheet II. 763, West India islands and Caribbean sea, sheet III. 3344, San Domingo :—Fort Liberté, Manzanillo and Monte Cristi bays. 541, South America, east coast :—Rio de Janeiro harbour. 827, India, west coast :—Vengurla to Cape Comorin. 40, India, west coast :—Karachi harbour. 829, Bay of Bengal :—Cocanada to Bassein river. 814, Bay of Bengal :—The Sandheads, False point to Mutlah river. 821, Bay of Bengal :—Elephant point to Cheduba strait. 287, Borneo :—Gaya bay on the west to Sandakan harbour on the east. 1650, Borneo :—Mallawallé island to Lankayan. 2577, Philippine islands :—Between St. Bernardino and Mindoro straits. 389, China, north-east coast :—Shanghai harbour. 2759a, Australia, northern portion. 2759b, Australia, southern portion. 1750, Australia, south coast :—Port Adelaide. 2119, Australia, east coast :—Newcastle harbour. 780, Pacific ocean, S.W. sheet. 782, Pacific ocean, N.E. sheet. 786, Pacific ocean :—Cape Horn to Cape Corrientes. 2459, North-West Pacific ocean, including Yellow, Japan, and Okhotsk seas. 1510, Sandwich islands. 1378, Sandwich islands :—Honolulu harbour.

#### Indian Ocean and Red Sea.

Meteorological Office.

Monthly meteorological charts of the Indian Ocean north of 15° S. lat. and Red Sea, June, 1908. London : Meteorological Office, 1908. Price 6d. each. Presented by the Meteorological Office.

#### North Atlantic and Mediterranean.

Meteorological Office.

Monthly meteorological charts of the North Atlantic and Mediterranean, June, 1908. London : Meteorological Office, 1908. Price 6d. each. Presented by the Meteorological Office.

#### North Atlantic.

U.S. Hydrographic Office.

Pilot charts of the North Atlantic Ocean, May and June, 1908. Washington : U.S. Hydrographic Office, 1908. Presented by the U.S. Hydrographic Office.

#### North Pacific.

U.S. Hydrographic Office.

Pilot chart of the North Pacific Ocean, June, 1908. Washington : U.S. Hydrographic Office, 1908. Presented by the U.S. Hydrographic Office.

#### Norway.

Norges Geografiske Opmaalning.

Kystkartet : Generalkart A 1, Skagerrak. Scale 1 : 350,000 or 1 inch to 5·5 stat. miles. 2 Sheets, 1907. Specialkartet. Scale 1 : 50,000 or 1·8 inch to 1 stat. mile. B 54, Den Norske Kyst fra Lurö til Nesøen og Rödö ; B 56, Den Norske Kyst fra Stött til Saltfjorden. Christiania : Norges Geografiske Opmaalning, 1908. Presented by the Norwegian Geographical Institute.

#### Position Line Chart.

Edmond.

Edmond's Position Line Chart, on Mercator's Projection, for all Latitudes. Presented by A. J. Vogan, Esq.

This chart is intended to furnish the navigator with ready means of plotting the "Position line" in Sumner's method for any desired latitude. It measures 22 inches by 18 inches, and consists of a rectangular figure, up and down which are ruled one hundred parallel lines, fifty on each side of a central line or meridian. The vertical lines are spaced to minutes of longitude, and can be numbered to include the required scope of longitude.

The point where the central meridian meets the base-line of the chart is the centre of a protractor, the degrees of which are marked off on the two vertical sides and the top horizontal line of the chart. For a scale of latitude and distance a pencil line is drawn from the zero at the centre of the base to the latitude on the outside numbers of the protractor to right or left ; the minutes of longitude will then cut this diagonal at minutes of latitude. Any distance or difference of latitude can be measured along this scale, and can be read off by the numbers at the base. Printed instructions are furnished with the chart.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.









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## THE DOUGLAS GLACIER AND ITS NEIGHBOURHOOD.\*

By JAMES MACKINTOSH BELL, A.M., Ph.D., Director of the Geological Survey of New Zealand.

### 1. INTRODUCTION.

THE Douglas glacier lies in one of the most inaccessible parts of the Southern Alps of New Zealand, and forms one of the most remarkable physical features of that splendid chain of snow-clad mountains. The glacier is situated in the district of Westland, on the western slopes of the Southern Alps, which form the main divide of the South island. The frontal face, in approximately  $43^{\circ} 42'$  S. lat., is within 25 miles of the Tasman sea. From the "snout" of the glacier issues the Twain river, which forms one of the main tributaries of the Karangarua river. At a point some 3 miles above the frontal face, on the south-eastern side of the glacier, Douglas pass—a snow-covered saddle—leads into the McKerrow glacier, which formerly flowed partly down the valley of the upper Karangarua, but now forms the source of the Landsborough river. Some miles north from the Twain river, the Karangarua receives the Copland river, which rises in the Marchant glacier some miles north of the Douglas glacier.

### 2. NARRATIVE.

During the summer of 1907, a reconnaissance was made by the writer, with a small party, of the country in the neighbourhood of the Douglas glacier—our object being to gain a general geological and geographical knowledge of this wild and interesting section of New Zealand, with a view to commencing more detailed investigations at a later date. Owing to the inaccessibility of this portion of the country,

\* Read at the Royal Geographical Society, November 11, 1907. Map, p. 216.

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and to the extremely wet climate, the exploration was conducted with considerable difficulty. All supplies had to be brought on pack-horses to Scott's house, situated near the mouth of the Karangarua, on what is known as the great South road—a lonely and little-frequented trail, which has been cut for many miles through the dense forest of the district of Westland at a short distance from the seashore.

From a few miles above Scott's house everything had to be carried into the interior on our backs, up the wild Alpine rivers; across glaciers, broken by crevasses and heaped with moraines; and over wind-swept mountain passes. Consequently our outfit was, of necessity, most simple, and only a single ply of canvas protected us most of the time from the often very boisterous climatic conditions.

Our route lay up the valley of the Karangarua, which seemed to open the readiest and easiest highway to the Douglas glacier, and to the valley of the upper Landsborough. A base camp was pitched at Cassel's flat, some 14 miles up the Karangarua river from the mouth, and on the left side of the stream, this point being easily reached by a rough track which follows the right bank of the Karangarua, and traverses the river to the opposite bank by a good ford just below the mouth of the Copland.

From Cassel's flat we pushed our way up the Karangarua, and on the third day's march camped just below Karangarua pass, which lies at the head of the stream, and which leads into the McKerrow glacier. The route lies almost entirely along the boulder-strewn river-bottom, leaving it only where rock precipices border the water or where pronounced waterfalls occur. Travelling is not easy—one has to ford and reford the stream in the ice-cold water to seek the best route along the bank; moreover, the constant jumping from boulder to boulder with a pack on one's back soon becomes tiresome. The greatest difficulty occurs in the gorges, or at the waterfalls, where one has to leave the river-bottom and scramble through the tangled vegetation that clings to the very steep slopes on either side of the river, and forms a serious obstacle to advance right to the base of Karangarua pass. Near the pass the huge size of the boulders in the stream, and the many waterfalls, render the travelling especially difficult and in places dangerous.

At our camp just below Karangarua pass, our advance was stopped by several days of thick weather; but we were rewarded for this delay by radiantly fine weather in which to cross Karangarua pass, make our way up the McKerrow glacier and over Douglas pass into Fitzgerald flat. Near the old lateral moraines of the Douglas glacier, which borders Fitzgerald flat to the westward, we found a good and sheltered camp with mountain scrub for our fire.

The route from Karangarua pass to Fitzgerald flat is distinctly an easy one, the only difficulties—and these slight ones—being experienced in the short descent down the rocky slope leading from Karangarua

pass to the McKerrow glacier, and in the long descent down the steep, slippery, grass slope from Douglas pass to Fitzgerald flat. Neither difficulty is so apparent in ascending to either pass. Karangarua pass was almost entirely free from snow at the time of our visit, but Douglas pass, which is a few hundred feet higher, was snow covered.

The long and almost impassable gorge of the lower Twain river prevents an examination of the Twain-Douglas valley from that end. Consequently all our investigations were conducted from our camp on Fitzgerald flat. We remained for several days in the valley, being unfortunately prevented by bad weather from making all the desired



HEAD OF MCKERROW GLACIER.

examinations of the wonderful Douglas glacier and icefall and of the immediate neighbourhood.

Leaving Fitzgerald flat in a thick fog, we recrossed Douglas pass, and, descending the McKerrow glacier, pitched our camp just below its frontal face on the shores of the Landsborough, where sufficient mountain scrub was found for fuel for cooking purposes. Here we remained for over a week, and roughly examined the country as far down the Landsborough river as the entrance of the Fettes glacier, which is situated some 8 miles below the frontal face of the McKerrow glacier.

The whole valley of the Landsborough is most difficult of investigation, owing to the fact that the main stream is unfordable for practically its entire course, while many of the numerous tributary streams entering from the glaciers on either side can be traversed only

with very considerable danger. Moreover, the travelling along the river is everywhere arduous owing to the almost entire absence of the grassy gravel flats which, along most of the streams of this locality, vary the monotony of the long stretches of boulder bank over which one has to scramble in going along the stream.

For several miles below the McKerrow glacier the banks of the Landsborough are free from large trees, but here and there Alpine scrub grows in considerable abundance, and everywhere during the summer the valley is gay with a brilliant Alpine flora.

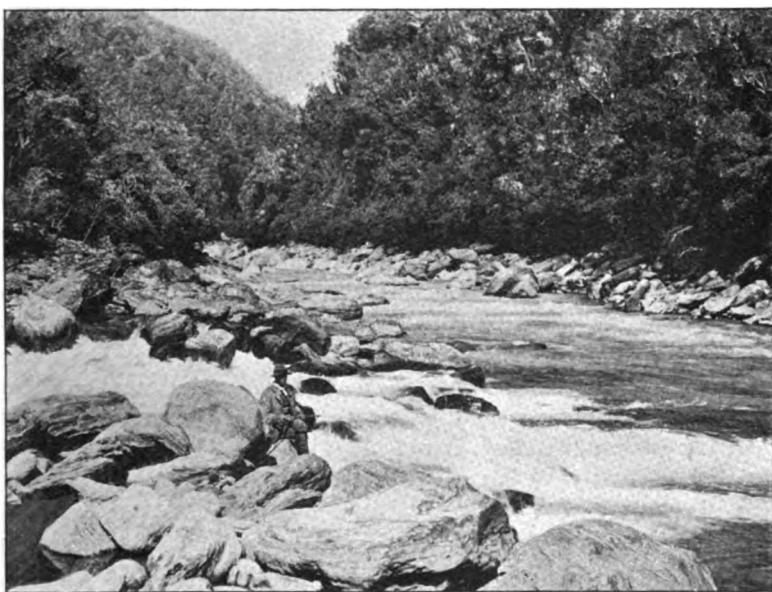
On the Landsborough we unfortunately had exceptionally bad weather, with mist, rain, and even snow, consequently we were never able to get a really good view of the main ridge of the Alps, which lies close to the Landsborough on the east, a fact which was greatly to our disadvantage when we came to leaving the river. Our intention was to seek a pass over the Alps to the eastward, into the Mueller glacier—lying on the eastward or Canterbury side of the mountains—whence there would be an easy descent of about 9 miles to the Government accommodation house at the "Hermitage." From the maps in our possession, it was evident that the pass lay at the head of the Spence glacier, and that it entered the Mueller close to the head.

Of course it was impossible to cross a lofty and unknown pass in bad weather, but when it at last cleared, my party was at once divided—two men returning with all the camp gear, the way we had come by the McKerrow glacier and Karangarua river—while the other two men with myself started light, up what we supposed to be the Spence glacier. As our departure from the Landsborough had been several days delayed, owing to the bad weather, we had been on rations for some time, and were buoyed up on our onward journey up the glacier by the hope of plenty to eat that night at the Hermitage.

The route which we followed lay along the lateral moraine of the supposed Spence glacier for a mile or more, and then the broken ice of the glacier itself was followed to the base of an ice-fall, above which a snowfield of gradual inclination led to the summit. Owing to the new snow and the very broken character of the ice, the ice-fall was ascended with difficulty and with great loss of time. When we at last reached the *névé* thick weather had come on again, and it was snowing hard. In the snowstorm we floundered about for some hours, unable to find our way, but at last, after traversing several gaping bergschrunds, late in the afternoon we reached the crest of the pass. Here, to our disappointment, we beheld far beneath us in the storm, down ice-falls and rock precipices, not the smooth upper slopes of the Mueller glacier, but a rocky valley, and heard the roar of a mountain torrent. We had come up the wrong glacier, and were several miles too far south. Later we learned it was Le Blanc glacier we had ascended, and not the Spence, and had consequently reached the pass into one of the tributaries of the

Dobson river. It was many miles down that wild mountain stream to the nearest habitation, and consequently, even at that late hour of the day, there was nothing to do but to return the way we had come: down Le Blanc glacier, up the McKerrow glacier, over Karangarua pass, and down the Karangarua river.

By hard travelling, late in the night we reached the camp of our two men, who had parted from us in the early morning, and together next day we continued the journey down the Karangarua. During the return journey it rained incessantly, and consequently, being unable to make the ford across the Karangarua, we were held for a day at Cassel's flat, on very scanty provisions.



JUNCTION OF COPLAND RIVER AND ARCHITECT CREEK.

When we reached Scott's house, owing to the varied unpleasantness which we had endured on the trip, we were very loath to continue our explorations, but with clearing weather the mountains looked so resplendent that we were allured again into their midst. This time we travelled up the Copland river, and, crossing Fitzgerald pass near its head, descended into the Hooker glacier, down which we passed to the Hermitage.

The trip up the Copland from Scott's House to the Hermitage can be easily made in three days. Travelling, on the whole, is much easier than in the Karangarua, though there is the same scrambling through the dense undergrowth and the same tiresome jumping from boulder to

boulder. Only one fording of the Copland is necessary—namely, at Welcome flat, about halfway from Scott's house to Fitzgerald pass—the ford being made in a safe and desirable locality.

The ascent from the valley of the Copland, at a point not far below the frontal face of the Marchant glacier, in which the river rises, to Fitzgerald pass is not difficult, but is long and arduous, being up steep grass slopes, across talus slides, and up a long snow face to the summit. The descent on the eastern side of the Alps is over a snowfield broken by several wide crevasses, down a rocky arête and steep talus slope to the Hooker glacier.

In our trip up the Copland we were again unfortunate in having exceptionally bad weather, but we were recompensed for the trying journey in continuous rain by the magnificent view which we obtained from Fitzgerald pass when we got beyond the storm-clouds and into brilliant sunshine. The pass lies in the very heart of the Alps, and northward and southward are visible from its summit, a seemingly endless array of white snow-covered peak and of deep ice-filled valley. It was approaching sunset when we arrived at the pass, and the splendid peaks of Cook and Sefton near at hand and various other lofty mountains further away shone clear and golden above the sea of gloomy purplish clouds, which filled the valleys and rolled out on to the lowlands.

During the whole course of the reconnaissance, which lasted about four weeks, we had exceptionally bad weather, even for this very wet part of the country, but notwithstanding this fact, we were able to obtain a good general idea of the main geographical and geological features in the Karangarua valley, in the Douglas-Twain valley, in the upper Landsborough valley, and in the Copland valley.

### 3. GEOGRAPHICAL DESCRIPTION.

(a) *The Douglas Twain Valley.*—The Douglas glacier, like all the glaciers of New Zealand, is but the shrunken remnant of what was formerly a much more majestic feature which spread down the straight valley of the Twain river, and joined the ancient Karangarua glacier, later to be described. At present, the Douglas glacier may be said to consist of two distinct parts—the *névé* of the glacier, and the trunk or glacier proper, separated by a precipice of gigantic proportions. This precipice, which is nearly 4000 feet in height, exhibits in the upper 2000 feet an ice-fall of splendid magnificence, while the lower part is an almost vertical face of rock.

The *névé* lies at the base of Mount Sefton, one of the finest peaks of the Southern Alps, and extends westward along the Copland range. Its length and breadth are very roughly about 3 miles. For the most part the *névé* is smooth, but towards the edge of the ice-fall its surface is broken by great crevasses, and elsewhere near the crest of the Copland ridge, and at the base of the western slope of Mount Sefton

bergschrunds of magnitude appear. The great precipice continues along almost the whole length of the *névé*.

The trunk part of the Douglas glacier rises in a great rock-girt cirque at the easternmost end of the great precipice, continues along its base, and flows onward between steep rock walls, with a total length of about 6 miles. The Douglas *névé* may be considered as a cliff glacier on a big scale, while the trunk portion or glacier proper, formed by the union of innumerable avalanches descending over the great precipice, is a typical valley glacier of the reconstructed type.

The course of the Douglas glacier proper is not straight, a pronounced bend occurring just below the great precipice. Continuous in



FOOTSTOOL, MOORHOUSE RANGE AND COPLAND PASS.

direction upward from the Twain river valley and that of the lower portion of the Douglas glacier is the valley of the Fitzgerald stream and glacier, separated from the Douglas glacier by the several pronounced lateral moraines of the latter. The frontal face of the Fitzgerald glacier lies some 3 miles from the edge of the Douglas glacier, and below the stream meanders in several anastomosing channels across the gravelly stretches of Fitzgerald flat, becoming lost in the old lateral moraines of the Douglas glacier.

An imposing rock buttress, rising towards Mount Sefton and Mount Brunner, separates Fitzgerald flat from the upper part of the Douglas glacier trunk, while a rugged ridge of mountains, dotted with many beautiful cliff glaciers, separates it to the southward from the upper ice

of the McKerrow glacier, later to be described. At the lowest point on the latter ridge is Douglas pass, leading from Fitzgerald flat into the McKerrow glacier. To the westward this same ridge, surmounted by the fine peaks of Mount Howitt and Mount Notable, forms the rugged broken mountain country between the Twain-Douglas valley and the upper part of the Karangarua.

Unlike many of the glaciers on the western side of the southern Alps, the much-crevassed ice of Fitzgerald glacier and the Douglas glacier proper are heavily clothed in moraine. This condition is due partly to the very friable nature of the interstratified phyllites and grauwackes through which the two glaciers flow, and which here compose the massif of the Alps, and partly to the fact that the descent of both glaciers from the cirques at their respective heads is more gradual, and the flow consequently slower, than in the case of the better-known west coast glaciers, such as the Fox and the Franz Josef.

At the frontal face of the Douglas glacier is a small pond, held in by a recent terminal moraine, through which the Twain river dashes in a considerable rapid.

From our camp in Fitzgerald flat a splendid view was obtained, the majesty of the mountains being greatly enhanced by the depression of the snow-line, due to the peculiar meteorological conditions characteristic of this portion of New Zealand. The picture is awe-inspiring rather than beautiful, but there is a certain wild and savage charm about it which brings its main features constantly back to one's memory long after the details of the wonderful ensemble have faded. To the north-west stand out clear against the sky the rugged peaks of the Moorhouse range, Sefton, Eric, and Maunga Ma. Behind are stately rock precipices, sprinkled at the lower levels with a scant Alpine vegetation, and at higher levels by numerous cliff glaciers of varying sizes, rising at lofty altitudes. Around are the moraines of the Douglas glacier—the old ones a veritable Alpine flower garden, the newer dark and gloomy in their stacks of bare rock *débris*. Down the broad, straight valley is dimly visible the Twain river, bordered by a forest of matchless beauty, showing every shade of green, and brightened by the gorgeous blood-red flowers of that wonderful New Zealand tree—the rata. The view in front, however, dwarfs every other aspect of the picture. There are to be seen the spacious fields of *névé*, and the gigantic precipice of séraced ice-fall and vertical rock-face, over which no less than thirty-seven waterfalls issue from beneath the ice. The roar of the avalanches constantly descending is like that of an unending cannonade. On the average over twenty-five descend in an hour, the roar of one avalanche having scarcely ceased when another has commenced. The sound echoes and re-echoes across that weird wild valley, and with such terrible intensity, that even at a mile away one can scarcely hear one's self speak when the noise is at its height. No other sound is to be heard, save the

occasional shriek of the kea, or Alpine parrot, and the quaint and varied cry of the weka.

Just below the Douglas glacier the Twain river meanders along a broad grassy floor, but nearer its mouth its course is through a rocky gorge. The Fitzgerald glacier and stream, the lower portion of the Douglas glacier proper, and the Twain river form together a valley which, running in a general east-and-west direction, somewhat diagonally across the strike of the strata, is almost exactly straight. According to one of my guides, the view from the summit of Conical hill, which sentinel the entrance of the Twain into the Karangarua, discloses the



LOOKING UP HOOKER TO PEROUSA AND BAKER'S SADDLE.

whole length of the U-shaped valley—a distance of some 15 miles—from the mouth of the stream in the dense luxuriant forest to the rock-girt cirque at the head of the Fitzgerald, into which the ice-falls descend from perched blocks of *névé* on the Moorhouse range. The whole form of the valley shows typically the effect of glacial excavation.

Below the Douglas glacier many old moraines appear on either side of the Twain river. Waterfalls are common, descending into the dense forest of the valley floor from lofty hanging valleys partially or wholly ice-filled.

The only large tributary entering the Twain river is the Horace Walker stream, flowing from the glacier of the same name. The Horace Walker glacier is remarkable in that its lower course is almost exactly

in the opposite direction from that of the Douglas glacier. The stream, flowing from the frontal face, turns around and joins the Twain at a broad angle. The Horace Walker glacier shows very beautifully the phenomena of crescentic crevasses arranged at right angles to the glacier walls.

(b) *The Karangarua Valley.*—The upper part of the valley of the Karangarua is open and straight, and, running in a general east-and-west direction, is almost exactly parallel with the Douglas-Twain valley to the northward. At the most westerly point of this stretch, namely, about 15 miles from the source, "The Cataracts," a series of broken waterfalls of great beauty, occur in the river. Below "The Cataracts" the Karangarua valley turns abruptly north for some 10 miles, receiving in turn the Twain and the Copland rivers on the east. At the junction with the Copland the course of the river turns about west-north-west, a direction which it retains to the sea—a distance of about 10 miles. The Copland, rising at the western base of Fitzgerald pass—a few miles north of Mount Sefton—forms, with the lower Karangarua, the main straight valley from the island divide to the sea.

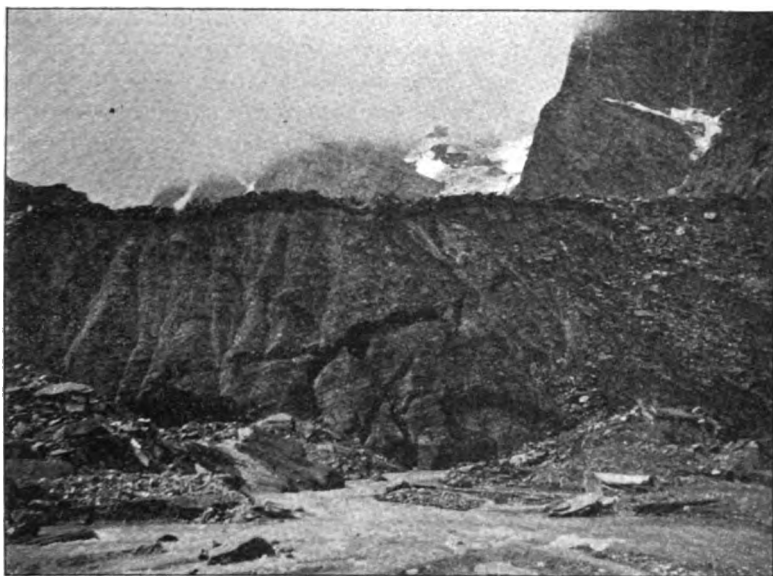
The source of the Karangarua is to be found in the many streams which descend abruptly from cliff glaciers perched on the rugged mountains around Karangarua pass. From the source to the mouth of the Copland, the Karangarua consists of stretches in which the stream is flowing with an even though rapid grade, broken by other stretches, in which the course is interrupted by strong rapids, cataracts, or wild gorges. Formerly a great glacier filled the valley of the Karangarua, flowing almost as far as the present seashore, and deploying on to the narrow coastal plain of Westland as a piedmont glacier. As this glacier retreated, successive terminal moraines were formed at intervals across the U shaped valley where the glacial retreat was temporarily retarded, and these were succeeded by spacious flats where the retardation did not take place. The pronounced rapids and falls occur where the old terminal moraines cross the valley, and are especially evident at "The Cataracts" above mentioned, while elsewhere the course of the river is more uniform.

Below the mouth of the Copland, the Karangarua enters the narrow densely forested coastal plain of Westland, and meanders with rapid current in many ever-changing channels, separated by grassy or bush-clad river flats, to the sea.

The scenery of the upper Karangarua is markedly beautiful. On either side steep, even precipitous, glacially smoothed rock slopes rise abruptly from the thick vegetation of the valley-floor up to broken snow-covered mountains. In many places waterfalls leap hundreds of feet from loftily perched glaciers, over precipices, down into the forest beneath. The contrasts of the whole are truly wonderful. From beneath the shade of a great tree-fern one may look down on the deep

blue water of the river, bordered by its forest of variéated green, brightened by the brilliant rata flowers, and up on to the dark rock slopes, the green and blue much-broken ice of the cliff glaciers, and, ever behind, the white array of snow-clad mountains.

(c) *The McKerrow-Landsborough Valley*.—The McKerrow glacier is formed by the union of many small hanging glaciers, which descend from small snowfields on the Moorehouse range, in the neighbourhood of Mount Thompson and Mount Isabell. The glacier is of the typical valley character. In its upper reaches lies a smooth broad open snow-field, while lower down it is considerably narrower, and its much-crevassed surface is completely shrouded in rock *débris*, with prominent



FRONTAL FACE, MCKERROW GLACIER.

lateral moraines on either side. The frontal face is distinctly imposing. Here rises a cliff of clear glassy ice, over 100 feet in height, from beneath which the waters of the Landsborough river rush with geyser-like fury. The McKerrow glacier was formerly a much more majestic feature, and, as already remarked, formed the source of the ancient Karangarua glacier. Now it is separated from the Karangarua valley by Karangarua pass, a low saddle on its northern side about 5000 feet in height, while, as mentioned before, Douglas pass leads on the same side of the glacier into Fitzgerald flat. Between Douglas pass and Karangarua pass enters from the slopes of Mount Howitt, the Maori glacier—a splendid piece of very much broken ice. To the south-east of the McKerrow rise the Dwarf and Mount Burns—both fine peaks—

with slopes showing hanging glaciers and ice-falls of fair dimensions. The length of the McKerrow glacier is about 6 miles, and its average width rather less than half a mile.

Unlike the Karangarua and its several main tributaries, the Landsborough river runs parallel, or nearly so, with the stratification of the rocks of the area, and is consequently, in the main, a strike valley. As its course is also almost parallel to the island divide, it is bordered to the eastward by lofty peaks of imposing grandeur, while a fine ridge of mountains, surmounted by the serrate crest of Mount Fettes, appears close to its north-western side.

The several glaciers which we examined on the eastern side of the Landsborough resemble the McKerrow on a small scale—that is, they either rise in hanging glaciers with much broken ice, or they are formed by the reconstruction of the ice descending in avalanches from cliff glaciers, and they have their lower courses much shrouded in moraine. None of the tributary glaciers on the eastern side enter the main river directly, but they are connected with it by streams of varying lengths. The prominent lateral moraines bordering these tributary glaciers and the pronounced tussock-covered terraces along the main river, are characteristic features of the upper Landsborough.

Unlike the tributary glaciers on the eastern side of the Landsborough, the Fettes glacier comes directly to the edge of the main stream, which it joins in a great wall of ice, nearly 100 feet high. The Fettes glacier has a steep and sudden descent from small *névé* fields, lying around the mountains of the same name. Thus its movement is rapid, and its surface consequently almost free from moraine. The Fettes glacier forms one of the most beautiful features along the upper Landsborough. Behind rises the sharp snow-covered crest of Mount Fettes, and on either side of the much-broken ice, near the frontal face, is a forest of variegated green and of scarlet rata.

(d) *The Copland Valley*.—The Copland river has its source in a small glacier, known as the Marchant, lying nearly at the base of Fitzgerald pass. Like the valleys of both the Twain and the upper Karangarua, that of the Copland is open and U-shaped. In its upper reaches, splendid much-smoothed precipices border the broad valley to north and south, between which old morainic *débris* is very conspicuous on either side of the stream.

Some 5 miles below the terminal face of the Marchant glacier, the Strauchan river, flowing from the glacier of the same name, joins the Copland, entering, in a series of cascades, over the huge terminal moraines of the Strauchan glacier. At Welcome flat, some 5 miles below the Strauchan glacier, occur, in strange contrast to the ice-cold water of the Copland, some hot springs which are depositing a brownish sinter.

The scenery of the Copland, like that of the Karangarua, is of great

beauty and of extraordinary variety. The trail which is to be constructed up the Copland will soon open this beautiful valley to the more venturesome of tourists.

#### 4. FIELD FOR EXPLORATION IN SOUTH WESTLAND.

Prior to our visit the great Douglas glacier, with its splendid ice-falls, had been seen by only four or five people, while the valley of the Landsborough river had previously been visited by only a few hardy



HANGING VALLEY, KARANGANIA RIVER.

explorers. In the triangular area between the lower Karangarua and the Landsborough are lofty mountains, few of which have been ascended, many Alpine streams which are still unexplored, and glaciers and snow-fields which are yet to be visited ; while east of the Landsborough is a still less-known area of rugged mountain and wild ice-filled valley.

Mr. G. J. Roberts, the chief commissioner for Westland, has done much splendid exploration in South Westland, and Messrs. C. E. Douglas, A. P. Harper, and E. A. FitzGerald have also been pioneers in

this little-known and very inaccessible portion of New Zealand. However, comparatively little is yet known of its detailed stratigraphical geology, of the size, or rate of movement of its innumerable glaciers, of the extent of its snowfields, of the height of its multiple splendid peaks, of its varied mineral wealth, of the peculiarities of its rich and luxuriant vegetation, and of the habits of its extraordinary bird-life.

In fact, a splendid field for intelligent exploration and scientific investigation is to be found among the wild mountains of Southern Westland.

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Before the paper, the PRESIDENT: Dr. Mackintosh Bell, for the last two and a half years, has been Director-General of the Geological Survey of the newly christened Dominion of New Zealand, and arrived in this country only a few days ago. It is rather a melancholy coincidence that about the same time that he arrived here we received news of the death of his very distinguished predecessor, Sir James Hector, the first Director-General of that Survey in New Zealand, a post which I think he had held since 1868. It is interesting to note that both Sir James Hector and Dr. Mackintosh Bell came from the old Dominion to what is now the new Dominion; they are both Canadians. Canada, as you know, is the country of surveys, the Geological Survey of Canada being one of the most celebrated institutions of that country, where for generations it has carried on a remarkable work, not only in geology, but in geography and other scientific fields. I may also mention that Sir James Hector was awarded our Gold Medal in 1891, and Dr. Hunter Bell, uncle to Dr. Mackintosh Bell, received our Gold Medal last year. Dr. Mackintosh Bell, the lecturer of the evening, has on two occasions contributed to our *Geographical Journal*: about six years ago he wrote a valuable article on the Great Bear lake region in Canada, and only two or three months ago, I think in August, he gave us another valuable article on "The Heart of the Southern Alps in New Zealand." The heart of the Southern Alps is where I think he has his heart at present. During the two and a half years that he has been in New Zealand he has already investigated a great deal of the field which, as Director-General, it is his business to inquire into; and as he is, if I may venture to say so, still a very young man, no doubt he will be able to do most valuable work in that direction. I will now call upon him to give us his paper.

After the paper, the PRESIDENT: We have present here to-night one of the most experienced representatives of New Zealand resident in this country—Lord Ranfurly, who was Governor for two consecutive terms without coming home. I do not know whether Lord Ranfurly can tell us much about the Douglas glacier, but he can certainly tell us a good deal about New Zealand.

EARL OF RANFURLY: I am afraid this is rather an unexpected surprise. The great Douglas glacier in my time in New Zealand was not known by name. Anyhow, though I was under the impression that I knew New Zealand from one end to the other, I had never heard of it before to-night. It is, as the lecturer has said, in the most out-of-the-way part; personally, I know its surroundings, Mount Cook and Mount Sefton, and the west coast. You all noticed one picture which struck me particularly, namely, the one showing the difficulty of landing, and I can assure you that it was by no means easy to land for two-thirds of the year on some portions of that coast. That made it very difficult for a governor who might have official duties constantly to perform to visit it, because if he went he might not be able to wait for the week or the fortnight that might possibly be necessary to effect a landing. I have myself visited most of that coast for a special purpose, namely,

obtaining cormorants and other sea-birds for the Natural History Department of the British Museum in Cromwell Road. I also visited the farther islands, such as the Auckland islands, Antipodes, Bounty islands, etc., islands mostly not inhabited, with a view to increasing the collection of birds in that museum. Travel, no doubt, in that glacier district in New Zealand is extremely difficult, but the Government of New Zealand have always looked well after the tourist by putting up mountain huts, and even provisioning them, so that it should be as easy as possible to see the enormous glaciers, glaciers far larger than those in Europe, though certainly Asia has ones of greater extent. Well, in these huts the Government have placed stores, tinned provisions, blankets, every necessity, and you only have to walk in and camp therein for the night; in that way it does assist materially all those who are fond of mountain climbing. At the same time, the mountains of New Zealand, as those pictures will have shown you, are not so easy, and there are but few people who have ever successfully reached the summit of Mount Cook.

The PRESIDENT: Dr. Mackintosh Bell, in his last words, referred to one mountain being named after that great man Charles Darwin, so I will ask Major Leonard Darwin to say a few words.

Major DARWIN: I should like personally to thank the lecturer for showing us that last beautiful slide, a slide especially interesting to me, as for the first time in my life I have seen a photograph of that mountain which has been called after my father. My own knowledge of New Zealand is not very great. I was there in 1874 and 1875, observing the transit of Venus, but I was at that time far too much engaged on the stars, the sun, and the planets to think about such a trifle as the Earth. But certain earthly things do remain very clearly in my memory. In the first place, I remember the great kindness I received from every one in New Zealand. In the next place, I remember very clearly the extraordinary beauty of that drive from the east to the west through those verdure-clad mountains. I was, moreover, specially interested to see the land which my father had visited, and which he had often spoken to me about. The incident most impressed on my boyish imagination was a certain picnic my father described in the north island—I forget exactly where—when he found the remains of another picnic close by. His knowledge of anatomy enabled him to detect the fact that the bones left amongst the ashes of that former picnic were human bones!

Dr. STRAHAN: I think that the lecturer has fully justified his statement that this is one of the most remarkable countries in the world. Though it occupies a somewhat subordinate position on the wall-map hung in this room, it certainly includes some of the most noteworthy phenomena to be found on the surface of the globe. Amongst these I may mention the fact that although it is not very far removed from the equator, yet owing to its configuration its glaciers are large, and they descend, I think I am right in saying, to within a short distance of the sea-level. That is an interesting fact, for we find that in past geological times the ice did descend nearly or quite to the sea-level in regions not far removed from the equator, and we see here an example of how that remarkable circumstance may be brought about.

There is one small matter which I should like to mention. The mountains have been named after various distinguished geographers, geologists, and travellers. One I notice is called Mount de la Bèche, and Bèche is spelt in our *Journal* and maps with a circumflex. Now, I can assure you that the name is not spelt in that manner. I appreciate the desire to do honour to De la Bèche by naming the mountain after him, but I feel that the honour would be greater if the name were correctly spelt.

We have had allusions in the course of the evening to the fact that the glacial

system has been vastly greater at some past period than it is now. That is an interesting circumstance to find in the Antipodes. Of course we are familiar with it in our own half of the globe, and the question arises, Did this extraordinary extension of glacial phenomena take place all over the world simultaneously? If so, one may fairly assume that the causes must have lain outside the globe and been astronomical. If, on the other hand, it was not simultaneous, it is conceivable that the extension of the ice was due to such local circumstances as an alteration in ocean currents, changes in the distribution of land, and so on. It is a difficult question to answer, and it requires an extremely minute investigation of the phenomena connected with the glaciation. This, however, is only one of many problems which lie before the director of the Geological Survey of New Zealand. He has a magnificent province, and I express the hope that not only will long life be spared to him to work it out, but that the Government of New Zealand will provide the necessary funds.

MR. DOUGLAS W. FRESHFIELD: That I have been called on emphasizes a fact I regret, that we have among us to-night none of those whose names are most associated with the heights of New Zealand. Neither Mr. Spotswood Green, whom we know so well in this Society from the papers he has read us, nor Mr. Fitzgerald, of whose pass we have heard often in the paper just read, nor those colonists, Mr. Harper and Mr. Mannering, who have also planted their feet and their names on the Southern Alps. I have, unfortunately for myself, no direct connection with the Antipodes, but I imagine I have been called upon because in this Society, as Sir Clements Markham represents the poles, I may be thought to represent glaciers, and anything glacial may be supposed to be akin to me. That is true in a certain sense, and I am glad to have an opportunity of speaking to-night because I cannot be here a fortnight hence, when what I have to say might have been more appropriate in connection with Dr. Hunter Workman's paper.

The whole question of glacial investigation has been touched upon by the last speaker. I desire to remind you that some years ago there was founded abroad, chiefly through the energy of a member of the Alpine Club, the late Captain Marshall Hall, an International Commission for the study of glaciers, which is now engaged in collecting from every quarter of the globe all the statistics that can be obtained which may serve to throw light upon the secular, or minor, advances and retreats of glaciers. We all know that there was once a glacial period when glaciers covered much more ground than they do now on the surface of the globe. But there have also been within the memories of some of us very remarkable oscillations in the European glaciers. In 1854, when I was a boy, I saw the Chamonix and Grindelwald glaciers at their maximum; they are now probably at their minimum. There have been slight temporary advances, but the general movement throughout the Alps for the last fifty years has been one of retreat. We must not, however, assume that there will not be a fresh advance, because from various historical facts and records, which I cannot enter into here, we know that the glaciers in the Alps have gone backwards and forwards for the last four hundred years. There is therefore good reason to anticipate they may go forward again, and that Mr. Ruskin's hypothesis, that the glaciers are retreating on account of the vulgarity of tourists, may prove to be unsound. But our Glacier Commission has had rather uphill work to begin with in obtaining trustworthy observations, and I need hardly say that its work has not been easiest in British territories, because where you have to deal with a British Government department, it requires considerable pressure to get a new branch of scientific observation started. But within the last ten days I have had the gratifying announcement that in one of the most important British possessions, in India,

the work of observing the Himalayan glaciers is thoroughly established. The Director of the Trigonometrical Survey there, Colonel Burrard, R.E., whose last report I hold in my hand, has handed over to the Geological Survey the task of measuring the great glaciers of the Himalaya, and the Survey officers are taking measurements which will record exactly from year to year the oscillations of the ice in many typical ice-streams. The first instalment of these measurements is full of very interesting detail, showing how some of the shorter glaciers, in the midst of a period of retreat, are making sudden little spasmodic advances, apparently disconnected with the general movement, exactly like those which have been observed in the Alps. I may add that this movement in India is probably very largely due to Lord Curzon, for it was in his vice-royalty that the pressure which is necessary to make departments move was provided. I think it would be premature to attempt to lay down exactly the causes of the inconsistency in glacial oscillations. We are busy collecting facts, and I have no doubt in time we shall have a scientific theory for all the movements of glaciers. It is not only from India that we are getting information, but from Canada and the United States we receive valuable material. New Zealand also sends us the reports of the New Zealand Survey, which are very elaborate and admirable, and I have no doubt, under the direction of the present Director of Geology there, we shall have reports dealing with the movements of the glaciers as scientific as the one I am holding in my hand, which has just come from India.

With regard to the New Zealand Alps, as I said, I have no personal knowledge, but I had on a recent occasion to read up all the available literature connected with them, and I was greatly impressed by the extraordinary difference between the east and west coasts, and the wonderful scenic attractions of the latter. Its misfortune is that, like all the most attractive sides of mountains, it is the rainiest side, and the unfortunate mountaineer who is shut up in a small tent or under imperfect shelter in perpetual rain and mist, in which he can do and see nothing, is apt to think Providence is perverse, forgetting that it is the rain that makes the beauty; since it is the rain that lowers the snow-level, that feeds the forest and the ferns, and that fortifies the streams to carve and model the lower parts of the mountains into varied and picturesque forms. I am very glad to hear that substantial huts are being provided on the west coast. When that is accomplished, I shall be happy to recommend the younger members of the Alpine Club to hurry out to New Zealand.

Mr. GARRISON: The names of some of the more prominent men connected with mountaineering in New Zealand have been mentioned to-night, among them those of Mr. Fitzgerald, Mr. Harper, and the Rev. Spotswood Green, but I think none of the speakers have mentioned the name of a gentleman who ought not to be overlooked—that is Mr. Malcolm Ross, who has done some splendid work in the New Zealand Alps. For some years he was the editor of an Alpine journal, published in New Zealand, and he has sent home recently some very fine photographs to our Society. I think it right this gentleman's work should be recognized. As one who knows New Zealand well, and who has crossed its great glaciers, I thank Mr. Bell for the splendid pictures he has given us. I know a good deal of the ground, and I should like to say I think it is perfectly justifiable to speak of New Zealand as the wonderland of the world, it has such a marvellous variety of natural phenomena. I should like to have heard Mr. Bell tell us something about why it is that the glaciers in New Zealand come down lower to the sea-level than any other glaciers outside the Polar Regions and the Straits of Magellan. I think it worth mentioning that the great Tasman glacier, which is larger than any glacier in Europe, at one time was supposed to have been 70 miles in length and 30 miles in width.

Mr. BATHER: It has been a great pleasure to me to be reminded of my short visit to New Zealand by this exceedingly interesting lecture. Some of the views which he showed us undoubtedly show the stratification of the rocks in such a clear manner that they must throw light on the geological structure of the country, and no doubt he has brought back with him numerous observations of purely geological interest.

Dr. JAMES MACINTOSH BELL: I have only a few remarks to make in reply to those which have been made by the various gentlemen who have spoken. I would like to say that it is very apparent to those tourists who have been fortunate enough to visit the Southern Alps of New Zealand that the Tourist Department of the New Zealand Government Service supplies huts even in some very inaccessible parts of the Alps. But on the west coast side of the Alps, owing to the wild nature of the country, the huts are very few. There is one at the Franz Josef glacier and one at the Fox glacier, and a track has just been constructed up that wild Copland valley of which I spoke, and this will bring the marvellous scenery of that beautiful river into touch with even the less venturesome tourists. At present the great Douglas glacier and its neighbourhood is not very accessible, but mountaineers who are accustomed to the trials of mountaineering in the Swiss Alps, should find comparatively little difficulty in exploring anywhere amid the Southern Alps of New Zealand. In regard to mountaineering on the west coast side, although the climate is very rainy, I have been there sometimes for five or six days at a stretch when there was hardly a cloud in the sky, and I do not think anything can compare with the softness of the weather when it is fine. Mr. Malcolm Ross is well known as a climber in the Southern Alps, and his name is much respected among mountaineers in New Zealand. His explorations have been chiefly in the country farther east and north than the Douglas glacier. The glaciers of New Zealand are, as one gentleman has pointed out, of very great size indeed considering the nearness of New Zealand to the equator. Dr. Von Hochstetter, of the Novara expedition, mentions that one would have to go as far north as lat.  $67^{\circ}$  to find a glacier as large as those we find in lat.  $43^{\circ}$  or thereabouts in New Zealand. The snow-line in New Zealand is very much depressed owing to the disposition of a ridge of lofty mountains at right angles to the prevailing moisture-laden winds. This depression of the snow-line and the great precipitation account for the large size of the glaciers at such a short distance from the equator. The glaciers descend to relatively very low altitudes because of the heavy precipitation, and because of the steepness of the enclosing valleys. The Franz Josef comes down to just about 200 feet above sea-level, and the frontal face of the Fox is at almost the same height above the sea amid a luxuriant vegetation.

The PRESIDENT: I do not know whether any other Fellow of the Society or visitor would like to address the meeting; but if not, as I have never had the advantage of visiting that earthly paradise, New Zealand, I will not detain you, but will at once propose a hearty vote of thanks to Dr. Mackintosh Bell for his most interesting lecture, and to express what we must all feel, that we must know New Zealand better after that most admirable series of pictures he has thrown upon the screen.

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## THE EXPLORATION OF PRINCE CHARLES FORELAND, 1906-1907.\*

By WILLIAM S. BRUCE, LL.D., F.R.S.E.

In the spring of 1906 His Serene Highness the Prince of Monaco invited me to accompany him for a third time on a voyage to Spitsbergen. Such an invitation at once indicated that this was an opportunity to carry on scientific research in the polar regions under most auspicious circumstances, and was therefore irresistible. For no explorer has done better work from the modern standpoint than His Highness, nor has he accomplished that work more modestly, not seeking, and, indeed, not fancying to play to the sensational. The steadiness, excellence, scientific value, and long endurance of his efforts have, bit by bit, culminated in scientific bodies of importance in Europe seeking to shower upon him their highest honours. Last year the Royal Scottish Geographical Society gave him their highest award, and this year your Society has followed by conferring upon him, with the approval of his Majesty, one of the Royal Medals.

Spitsbergen was already familiar to me. I made my first acquaintance with it in 1898 on board Major Andrew Coats' yacht the *Blencathra* (afterwards *Pandora*), and explored there in the same and following years with the Prince of Monaco. I had seen almost all the seaboard of the archipelago from east to west and from north to south, and something of the interior during many inland excursions and from altitudes exceeding 3000 feet. I had also taken part in the detailed work of the survey of Red bay, which was carried on under the direction of the late Captain Guisnez, of the French navy. In 1906 the Prince again planned a visit to the north-west of Spitsbergen, partly with the object of continuing the survey of Guisnez to the south and west, and partly with the object of investigating the higher atmosphere by means of kites and balloons. Thus the opportunity presented itself to me to take up the survey of Prince Charles foreland, which, though discovered more than three centuries ago, was yet almost entirely unknown.

It is true that the British Admiralty and others have given a more or less definite map of the island, but on examination I have found this to be, as I expected, little more than a conglomeration of a series of indefinite sketches, all inaccurate, but each one less inaccurate than the resultant conglomeration.

In another place† I have given an historical retrospect of our

\* Read at the Royal Geographical Society, April 13, 1908. Map, p. 216.

† "Prince Charles Foreland," by William S. Bruce, F.R.S.E. (with Illustrations and Map), *Scot. Geo. Mag.*, vol. 23, No. 3, March, 1907.

knowledge up to 1907 of Prince Charles foreland, and I must refer you to that note, and a continuation of it which is about to appear, for full details, but it may not be out of place to give a brief summary on the present occasion.

Prince Charles foreland was discovered in 1596, on June 25, by Barents and Heemskerke, who sighted and named Vogel hook, and so named it because of the innumerable birds there. Already, in 1612, the whole island was named Prince Charles foreland after Charles, son of James VI. of Scotland. Poole, sent out by the Muscovy Company, visited and named many parts of the island in 1610, 1611, and 1612, and, indeed, first gave us a general idea of the size and position of the island. Phipps, with young Nelson on board, visited the island in 1775. Scoresby made his first landing in an arctic land at Vogel hook. Poole, Scoresby, and Lamont give good descriptions of the island. Baron Nordenskjöld, Lamont, Conway, and the Prince of Monaco ran through Foul sound with their yachts or launches.

Dr. A. G. Nathorst, however, in 1898, was the first to make systematic scientific observations on the island during two or three hours on a summer night. Only two phanerogams were previously known; but now Anderson and Hesselman in these three hours found no fewer than twenty-nine species. The only birds Nathorst refers to are eiders and guillemots, though he must have seen others. Nathorst has referred to the rocks of the foreland near where he landed as belonging to the Silurian formation of the Hecla hook series.

This brief retrospect will give you some idea of our knowledge of Prince Charles foreland, which, as you see, was scanty in the extreme. The literature of the island extends over a period of three centuries, and into this I have dipped to a very considerable extent; but, after all, though the labour involved in going over the literature for so long a period is very great, it amounts to little more than finding who has priority in assigning the many names given to various parts of the island, and as there has never been a systematic map of the island made until the present day, it is often difficult to know what landmarks the various explorers refer to. In the new Scottish chart, which is actually the only real chart extant, I have endeavoured to include all names previously given, except where historical priority has compelled me to choose one in favour of another.

I shall divide my subject into two parts, first giving you a narrative of the two Scottish Expeditions in 1906 and 1907, and secondly summarizing the results of these explorations.

On June 27, 1906, the Prince of Monaco steamed into Granton with his yacht *Princesse Alice*, and early on the morning of the 28th left with the Scottish party, consisting of Mr. Ernest A. Miller, Piper Gilbert Kerr, and myself on board. On June 30 we reached Bergen, where the

Prince took on board a party of Norwegians under Captain Isachsen, who were, like ourselves, to carry on geodetic work. On July 9 we reached Tromsø, and on July 11 we sighted Black point, the southern end of Prince Charles foreland. At 7.15 p.m. we were off Vogel hook, and 11.30 p.m. anchored in Coal haven, Deer sound.\* As we dropped anchor a shoal of white whales were sighted close to the shore, and the Prince lowered a whale boat with Wedderburn in charge to try to secure one.

Next day Isachsen and a party of nine left by the *Kvedfjord* (a small steamer chartered by his Highness) for Close cove, while Captain Carr, Professor Hergesell, and I went ashore to make theodolite observations for the ascent of a pilot balloon which had been liberated from the ship.† Afterwards I made a short excursion towards a rather remarkable waterfall, which fell over the edge of a glacier ice-cliff about two miles from the shore; and it is interesting to note that, although a very large volume of water was coming over the ice at this time, at about midnight, when I was in the crow's nest and could get a good view of the same place from that elevated position, no water at all was coming over the cliff, and the small river from this source, that ran into Coal haven, was also practically dry. This sudden stoppage of the flow of water may be sufficiently accounted for by a touch of frost, which had stopped the surface thawing of the glacier by the brilliant sun during the day. On July 14 the *Princesse Alice* left Deer sound for Close cove, and at about 1 p.m. the Scottish party left on board the *Kvedfjord* for Prince Charles foreland.

We landed on the east coast, about 3 miles from the north end of the island. By about 2 a.m. we had succeeded in landing all our equipment from the *Kvedfjord*, and she steamed back to the *Princesse Alice* in Close cove, leaving Kerr, Miller, and myself to set up camp. The next few days we spent arranging our stores, setting up instruments, and in local survey round our base camp.

On the 17th we set to work more seriously, and shifted camp from the east coast to the neighbourhood of Windy gowl. We carried no tent, because the extraordinarily rough nature of the ground prevented our taking more than our instruments, a few provisions, and sleeping-sacks. The country over which we passed was almost absolutely barren, there being hardly a plant along the whole route. Only two birds were seen—namely, one purple sandpiper and one arctic skua. On settling

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\* Hudson speaks of Whales bay in 1607, but applies the term very loosely and indefinitely ('*Purchas his Pilgrimes*,' vol. 3, iii. p. 573: Lib. Edinburgh University), but Poole, in 1610 (Id. 3, iv. p. 702), clearly defines Deer sound, and that name is the one to be accepted. The bay was named King's bay by Giles and Rep. in 1710, and appears as such in the present Admiralty chart.

† *Vide* H.S.H. the Prince of Monaco's lecture on "Meteorological Researches in the High Atmosphere," *Scott. Geo. Mag.*, vol. 23, part 3, March, 1907.

down for the night we had three other visitors—namely, two skuas and one fulmar petrel.

The journey was a somewhat laborious one, the distance of 4 or 5 miles having taken us over seven hours. The weather was brilliantly fine, and the sun scorchingly hot, so that we divested ourselves of as much clothing as possible, and even then sweated it out. There was bright sun all night, with a cloudless sky and a light westerly air. The scene from Windy gowl was a striking one. To the eastward we looked over the dreary, stony plains we had crossed, and beyond Foul sound,\* over the picturesque glacier-clad mainland of Spitsbergen, in the neighbourhood of Deer sound. To the westward, beyond a less extensive but more fertile plain, broken by several lagoons along the shore, stretched the calm western ocean, with no land between us and Greenland, and I may say at this time, with no ice in sight. On July 18 I sent Kerr and Miller back to the base camp for more stores, while I descended to the west coast and explored northward for some distance, making many preliminary observations, and securing a fox and a pink-footed gosling. The west coast was evidently very much more inhabited than the east, for I came across several gaggles of pink-footed geese, as well as eiders, purple sandpipers, and snow-buntings. I got back to camp about 11 p.m. in cold and misty weather, and Windy gowl, keeping up its reputation, compelled us to shift camp about midnight and go down to the plain below. Even there, sheltered as we were, we found the night cold enough without a tent.

Having taken longitude observations at this third camp on July 20 at about 9 a.m., we started back again, unloaded, at 10 a.m. for the base camp, doing the homeward journey, which had taken us seven hours when loaded, in about two hours. With all possible haste, we launched our boat, carrying with us a tent, and loaded her well up with sufficient provisions for a week; then, putting out to sea, we steered northward, in order to reach the west coast of the island in the vicinity of the camp we had left in the morning. At Vogel hook we were compelled to run for shelter into a cove, on account of a heavy sea and wind which got up from the westward. We were ashore for about two hours, investigating the wonderful bird rookeries, first discovered by Barents in 1596.

The vegetation was luxuriant with rich mosses, scurvy grass, and many arctic plants. Birds were countless—Bruennich's guillemots, razorbills, puffins, little auks, dovebies, kittiwake gulls, burgomaster

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\* *Foul sound*, named thus by Poole in 1610, and correctly described by him. "This Sound I named Fowle Sound, for in this Bay are three sounds; This I spake last of, which lyeth in South, and goeth out at Black-point" ('*Purchas his Pilgrimes*,' 3, iv. 702: Lib. Edin. University). The Admiralty and other charts call it Foreland sound.

gulls, skuas, fulmar petrels, pink-footed geese, purple sandpipers, and snow-buntings. The sea and wind subsiding somewhat, we continued our course round Vogel hook to the westward, and with some difficulty effected a landing about 1 mile south of Vogel hook on the west coast, as there was too much sea for us to continue our voyage southward. It became necessary therefore to push southward overland, that we might reach the camp gear which we had left in the morning, and bring it back to this new camp further to the north. It was fortunate that we had our tent this night, for it began to rain, a rain which was to continue almost without halting for the next fortnight.

Here, at Vogel hook, the hills, unlike those at most other parts of the foreland, come precipitously down to the sea, a short, sharp talus being surmounted by a cliff of hard quartzitic sandstone.

We remained at this camp until August 1, during which time the weather was continuously bad. Gale followed gale, and heavy seas broke on the reefy shore, blowing the spray right over the lower land. Fog and mist prevailed almost continuously, and heavy rain was the order of the day. Occasionally, for an hour, there might be a blink of sunshine, only to be followed again by thick, wet, stormy weather. An idea of the stormy weather may be had from the fact that we were never able during this fortnight even to think of launching the boat. On July 31, however, we actually believed we had a chance, but after trying twice found it impossible to launch, owing to the heavy seas.

On August 1 we marched by way of Windy gowl to the base camp, and at 11.30 p.m. the *Princesse Alice* and *Kvedfjord* anchored in 5 fathoms 2 miles from the land. Wedderburn came ashore with the launch at 7 a.m. on the 2nd, and we went on board the *Princesse Alice*. The Prince was at the gangway to meet us, and gave us a hearty greeting. We enjoyed a hot bath and excellent lunch, and securing some necessaries left for the shore. In the afternoon, having compared chronometers with Captain Carr, I took a good longitude. We then continued our survey work until August 30, mapping in great detail an area of nearly 100 square miles, or roughly, the northern third of the island. On the 31st we steamed southward through Foul sound with the *Kvedfjord*, and met the *Princesse Alice* in Green harbour that afternoon. On September 2 we took our departure from Green harbour, and reached Tromsø on September 5. Five days later we reached Trondhjem, and proceeded thence to Leith.

In 1907, mainly through the interest and generosity of the Prince of Monaco, a second Scottish expedition set out to continue the exploration of Prince Charles foreland under my direction. Leaving Edinburgh on May 28, we reached Trondhjem on June 2, where we fell in with Mr. Henry J. Pearson, and arrived at Tromsø on June 4. On June 7 we left Tromsø in the S.S. *Fönix*—a small steamer that

I had chartered—and landed on the west coast of Prince Charles foreland, nearly 12 miles from Black point, on June 11. There we set up our base camp, the *Fönix* leaving on June 14. My party consisted of Mr. Stewart Ross, M.A., Mr. J. V. Burn Murdoch, and Piper Gilbert Kerr, and a young Norwegian sailor, Svendaas. We made our base camp our headquarters until June 27, and we measured out a base line of 12,000 feet and carried on a detailed survey of the whole district, including three islands which I have named Edinburgh isles.

On that day Ross and I set out on an expedition to Cape Cold with our dinghy, the *Jessie*, across Antarctic and Nathorst bays, and reached our destination after five hours' pulling and sailing. On the 29th, according to arrangements, the *Fönix* arrived, and we made a cruise of four days with her, visiting Coal bay, Advent bay, Cape Boheman, and Festningen rock and Dödmans spit, where we made some observations relating to the survey of Prince Charles foreland. Thereafter we crossed over towards Bell sound, which was blocked with ice, and then along the whole of the west coast of the foreland, visiting Largo bay, Vogel hook, and the base camp of 1906, and returned to our west coast base camp on the evening of July 4. On the 7th we saw no less than seven steamers passing north and south, which gives some idea of the practical use of charting this unknown coast. On August 4 we sighted the *Princesse Alice* steaming southward 3 or 4 miles from the land. We had then for some time been fully prepared to start northward with the dinghy to continue the survey there, but persistently bad weather had prevented us. On the 7th, however, the hopelessness of proceeding by sea made me abandon the idea, and Ross, Kerr, and I set out on foot towards Cape Cold. During a large part of this past month survey was carried on under the most disadvantageous conditions of weather, and often was entirely impossible. But we succeeded in gathering material which secures a thoroughly good map of most of the foreland plotted to a scale of 1 : 100,000, and in the vicinity of the base camp of 1 : 10,000. We had during this time also made good collections of the eggs and young of birds, and of flowering plants, besides important collections of rocks and fossils.

The journey to Cape Cold was one of the heaviest I have experienced. Our load was packed on what we fitly called the "bogey," a sledge with two low-set, broad, heavy wheels, which is guaranteed to travel over any ground it meets with without upsetting, and which will stand strains and shocks, the second effects of which take the very heart out of those who, plodding on bruised feet, have to drag it and its load—their life and work. Yet I know of no more effective way than this of getting across such country as we had to traverse in the foreland. On August 10, the wind and weather at last being fair, Gilbert Kerr walked into the base camp, and after thirteen hours' travelling returned

with John in the *Jessie*, bringing with them a quantity of extra food supplies, and next day John returned to join Burn Murdoch at the "base camp." Fortune favoured us that day, and I secured a good series of theodolite angles at the south end of the low spit at Cape Cold. Early on the morning of the 13th, soon after we had turned in, I was awakened by a voice which I at once recognized as that of Hjalmar Johansen, Nansen's sole companion on his great sledge journey across the North Polar basin, whom I first met in Franz Josef Land along with Nansen. The Prince had brought Johansen with him on board his yacht, and he had now landed with Isachsen in Foul sound, opposite this year's base camp. Coming over to the camp, Isachsen and Burn Murdoch met; the next day Johansen came on to Cape Cold, bearing letters from my wife, the Prince of Monaco, Isachsen, Burn Murdoch, and others.

The Prince, on account of bad weather, had been unable to land Johansen earlier, and now, on account of the exceptional quantity and heaviness of the pack-ice, which this year lay between Spitsbergen and Norway, as well as on account of a case of serious illness on board, he was forced to leave for Tromsø with the *Princesse Alice*. This was a great disappointment to me, for I had hoped to compare my chronometers with those on board the *Princesse Alice*, and my party and myself would have thoroughly enjoyed the break of even a few hours in the genial company of his Highness on board his uniquely fitted yacht. Johansen remained with Ross, Kerr, and myself for the next three weeks, when we succeeded, not only in travelling to the northern end of the island and across the island to the east coast in many places, but also in completing the survey of nearly the whole of the west coast, and of joining up the work of 1907 with that of 1906 in a thoroughly satisfactory manner. I need not relate the details of the many journeys we made and the incidents that befell us: they were such as befall other travellers doing similar work; but I must praise the gallant support my comrades gave me, and when sore-footed over rough country, and in stormy weather, and for a time on less than half-rations, we completed the work, the result of which is the map which I am able to show you this evening. Nor must I forget those final six days ashore, when one and all in bad weather marched twice every day across the foreland and back, which is here  $5\frac{1}{2}$  miles wide, with loads of 100 to 150 lbs. on our backs, thus covering 22 miles daily under these arduous conditions, because the small sloop that was to take us back to Europe would not come round to our camp on the west coast.

At first sight it looks surprising that, whereas many parts of Spitsbergen are fairly well surveyed, and some especially so, such as, for instance, the parts in which the Prince of Monaco has worked during three summers, Prince Charles foreland was to all intents and purposes not surveyed at all. But the reason is plain. Prince Charles foreland

bears the brunt of the weather, and sifts it of its crude elements, as it were, before it passes it on to the mainland.

It is seldom that the mountains are clear of the dense canopy of clouds, which are often down to 100 feet, and not infrequently right to sea-level. Many parts of the west coast are fringed with reefs, and even in Foul sound the water is often very shallow and the bottom rocky. There are anchorages, but the approaches are uncharted, and ships keep well clear of the land. Frequently, too, the roughness of the seas, and the existence of many reefs a mile or two from the land, makes even boat-work risky, and wisdom compels one to choose only fine weather for such navigation.

Prince Charles foreland is about 49 miles long, and varies from  $2\frac{1}{2}$  to  $7\frac{1}{2}$  miles in width, and has an area of about 271 square miles. For a distance of 35 miles from Vogel hook southward there is a continuous series of hills, which I have named the Sidlaws, the Northern Grampians, and the Coolins. The central portion of these, lying between lat.  $78^{\circ} 34' N.$  and  $78^{\circ} 39' N.$ , rise over 3000 feet, and culminates in a peak to the north, which reaches an altitude of 3490 feet above sea-level, and which I have named Mount Monaco, and one to the south of 3250 feet that I have named Mount Jessie. The next 9 miles is a low-lying, rocky plain  $2\frac{1}{2}$  to  $5\frac{1}{2}$  miles broad, which I have named the Foreland laichs. The southernmost 5 miles is composed of an isolated group of hills on the eastern portion, and a rugged, lower-lying part on the west. This group of hills I have named Ross heights, the highest peak being Saddle mountain, 1300 feet. Along the whole of the west coast, except at Vogel hook and Cape Siteo, there is a fringe of low land from a half to  $1\frac{1}{4}$  mile in width, which is mostly raised beach, with a maximum height of 60 to 100 feet above sea-level. The formation of some of these raised beaches is as perfect as if the sea had only just receded; other rockier parts repeat history in their past reefs fringing the coast like those now at a lower level. At the back of this low-lying land the hills rise precipitously, but in the middle part of the island the eastern slopes of the highest mountains are heavily glaciated from their summits almost down to, if not quite, sea-level.

The rocks of Prince Charles foreland consist, firstly, of a series of metamorphic crystalline schists, together with white and reddish quartzites, possibly connected as regards age with some fine earthy, laminated dark shales in which we found no fossils. A hard grey limestone, having when weathered a rough surface, may also possibly belong to this older series. Secondly, fossiliferous limestone, the fossils obtained from which having been carefully examined by Dr. G. W. Lee of the Geological Survey of Scotland. Thirdly, flags of grey shale containing the remains of dicotyledonous plants of Tertiary age, which Dr. Nathorst has been kind enough to examine and determine. The detailed study

of the crystalline schists and accompanying quartzites and shales has been held over, for, in order to estimate their age with any degree of accuracy, a thorough knowledge of the fossiliferous (if any) strata immediately succeeding them is necessary. On the other hand, the examination of the fossiliferous blocks of limestone has proved highly interesting and remunerative, in spite of the rather scanty material I placed at his disposal.

"To sum up," says Dr. Lee, "it may be said that of the fossils studied, the two first categories belong to some horizon of the Carboniferous system, or possibly of the Permo-Carboniferous, whilst the others are Permian, but to which horizon of the Permian system they are to be referred cannot be decided at the present time. The Palæozoic fauna dealt with here being very similar to that of Spitsbergen, and dicotyledonous plant remains having also been found, as in Spitsbergen, there is good ground to suspect that the Mesozoic formations so well developed in the mainland may also be present in Prince Charles foreland. To solve this problem should be one of the chief objects of future expeditions, whilst a detailed study of the older Palæozoic series would likely bring to light interesting facts concerning the tectonics of the island and the age of mountain building, not to mention the possibility of discovering fossils of pre-Carboniferous age."\*

Little time, however, was available for the study of the geology or natural history of the foreland. The land gives evidence of only three mammals, namely, an occasional reindeer and the blue and arctic foxes. On the ice the bear is relatively scarce, and in the sea the Greenland whale (*Balaena mysticetus*) has been practically exterminated, though finback, bottlenose, and white whales still exist and are fished. The walrus is exterminated, and seals are scarce; only square flippers (*Phoca barbata*) and fleo-rats (*P. fetida*) are seen occasionally. We observed twenty-eight species of birds, and secured most of these as well as eggs and young. Specially to be noted are the great northern diver (*Colymbus glacialis*), Sabine's gull (*Xema sabini*), the razorbill (*Alca torda*), and the sanderling (*Calidris arenaria*): All these are rare or new records for Spitsbergen, and the finding of the young in down of the sanderling is specially interesting.† In marine biology we unfortunately did little, though we have some terrestrial invertebrates.‡ Concerning the flora of Prince Charles foreland, only two species of phanerogams were known in 1898; Nathorst's expedition brought the list up to twenty-nine, while the Scottish expeditions have

\* "Note on Palæozoic Fossils of Prince Charles Foreland, collected by Dr. W. S. Bruce," by G. W. Lee, Esq., D.Sc., *Proc. Royal Physical Society, Edinburgh*, vol. 17, p. 149 (1908).

† "The Mammals and Birds of Prince Charles Foreland, Spitsbergen," by W. S. Bruce, LL.D., *Royal Phys. Soc., Edin.*, January 27, 1908.

‡ "Arctic Tardigrada, collected by Wm. S. Bruce," by James Murray, *Trans. Roy. Soc. Edin.*, vol. 45, Part III. (No. 25), 1907.

doubled the list, bringing it up to fifty-five species of phanerograms; besides this, one fern, one equisetum (previously recorded), one lycopod, nineteen mosses, and four liverworts were secured.\*

Mr. R. N. Rudmose Brown points out that the flora of the foreland is a purely European one, with no American elements. If American species had existed in the European arctic regions, Prince Charles foreland, the most westerly island of these regions, would have been the most likely place to find them, and their absence confirms the sharp botanical demarcation between Eurasian and American polar lands.

The map of Prince Charles foreland has been evolved in its present form by the skilled help of Mr. F. W. Hardie, while Mr. John Mathieson, of H.M. Ordnance Survey in Scotland, has constantly placed his valuable time and advice at our disposal in the conduct and confirmation of the work. Mr. A. F. Dyer (of Messrs. Carmichael & Sharman) also helped me to plot the results of the survey of the 1906 expedition. I heartily thank these gentlemen, as well as Mr. Thomas Heath, of the Royal Observatory, Edinburgh, who has given valuable help in the astronomical part of the work.

Finally, my most cordial thanks are due to H.S.H. the Prince of Monaco, who carried my two assistants and myself in his yacht to and from Prince Charles foreland in 1906, and gave me every possible assistance, besides, to a very large extent, financing the expedition, and who in 1907 again paid a large part of the cost of the expedition. I have also to thank my companions of both expeditions; what success has been attained is through their hard and skilled work and good fellowship, often under very trying and difficult conditions. The officers, scientific staff, and crew of the *Princesse Alice* were always ready and anxious to help, and always keenly sympathetic, and I greatly appreciate their kindness. Messrs. Whitson & Methuen and Mr. James G. Ferrier's help has also been invaluable to me in conducting the business affairs of both the expeditions.

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Before the paper, the PRESIDENT: Before we proceed to the business of the evening, I wish to inform those of you who are not aware of the fact that the alabaster tablet dedicated by the Royal Society, the Royal Geographical Society, and Trinity House to the memory of the late Admiral Sir Leopold McClintock is now in its place in Westminster Abbey, under the Franklin Memorial.

I now have to introduce to you Dr. Bruce, formerly Lecturer on Geography in the Heriot-Watt College, Edinburgh. He was appointed naturalist on board the *Balena*, which visited the Antarctic regions in the southern summer of 1892-1893, and his equipment was in large measure supplied by the Society. On his return, Dr. Bruce communicated a paper describing this work, which was printed

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\* "The Flora of Prince Charles Foreland, Spitsbergen," by R. N. Rudmose Brown, B.Sc., *Trans. Bot. Soc. Edin.*, vol. 23, p. 313 (1908).

in the *Geographical Journal*. He was engaged as superintendent of the Meteorological Observatory on Ben Nevis in 1895-1896, and when Mr. F. G. Jackson desired a naturalist to join his expedition in Franz Joseph Land in 1896, Dr. Bruce volunteered for the post, and was engaged in natural history collecting and physical geographical work in Franz Joseph Land until the return of the expedition. By his own efforts Dr. Bruce succeeded in raising the funds for the Scottish National Antarctic Expedition, which sailed under his command in the *Scotia* in 1902. On this expedition, he not only reported land and mapped a coast-line at higher latitudes in the Weddell sea than had been previously reached, but rendered conspicuous service to oceanography by his correction of the erroneous deep sounding made by Sir James Ross's Antarctic Expedition. He also induced the government of the Argentine Republic to continue the meteorological station which he had established at Laurie island, South Orkneys. Since his return Dr. Bruce has been working up the results of the scientific collections and observations, which are now in course of publication. I have not spoken of Dr. Bruce's repeated visits to Spitsbergen, both independently and as assistant to the Prince of Monaco, as he will himself touch on these in his paper to-night, which I now invite him to read.

After the paper, Sir MARTIN CONWAY : The paper to which we have listened raises for me so many points of interest that I hardly know which to touch upon. Dr. Bruce has referred more than once to the history of this interesting region. He mentioned that Prince Charles foreland was named after Prince Charles, afterwards Charles I. The suitability of the name becomes more apparent when you bear in mind that Spitsbergen was originally in England known as King James Newland, and that the neighbouring foreland was, therefore, very appropriately named after the king's son. I do not think it would be easily realized by the bulk of people, who only saw the photographs, how exceedingly toilsome it is to cross the apparently easy, level, low country of which we have been shown several views. Dr. Bruce has spoken of seven hours being not a very long time for crossing 4 miles, and we found many a similar 4 miles in other parts of the group. I notice on the map—and Dr. Bruce has pointed it out—in the north-east part of the island, a lagoon and the bay called Keerwyck. I take that to be the bay named Freshwater bay by Fotherby in 1613. When the English whalers first came to introduce whaling into this region, they settled on the two sides of Foul sound, both at the north end of Prince Charles foreland and on the opposite coast, at the place here named English bay, but which they very appropriately called Cove Comfortless. Opposite to English bay, somewhere on the other side, there was a bay which was called Freshwater bay, and they said they so called it because they went there to get their fresh water, and I notice on this map there is marked a little stream emptying into the lagoon, and I make no doubt that that was the fresh water which the old English whalers came to fetch. I am inclined to suspect Dr. Bruce will find that his Ferrier haven is the old Sea Horse bay of Baffin. Peter Winter cove is a little cove within Sea Horse bay on its north side. If on further examination he finds the bay further south, it may be the Sea Horse bay that he has not yet actually mapped, but I think he will find that Ferrier haven is, after all, the Sea Horse bay of the old whalers. Sea Horse bay is marked on the old maps opposite to St. John's bay. In conclusion, may I say one word about the whole scheme and idea of Dr. Bruce's work in Prince Charles foreland, to which he has devoted two seasons and proposes to devote a third? Spitsbergen is the first Arctic land to which any such minute examination has ever been applied as this which is being applied to it now. In Arctic regions the old explorers were quite content when they had set down the rough coast-line, and

marked the interior "high inland ice." That was all that was recorded about Arctic lands till quite recently. The examination of a small portion of an Arctic country, the mapping of it in detail, the setting down upon paper of its surface features, of the shapes and position of its hills, glaciers, and so forth, are an entirely modern undertaking. That is the kind of work on which explorers will be engaged in future, and not, of course, in polar regions alone. The great features of the large divisions of the world are now, in the main, fairly well known. The future of exploration is to examine in detail what is only known in its broad features. This work of Dr. Bruce's is an admirable example of the kind of results that can be thus obtained. In place of a splodge on the map, we now have an actual representation of a piece of land, with its mountain backbone, its plains and foreshores, its rivers and glaciers correctly depicted. When to that new information is added an examination of the structure of the rocks, the natural products of the country, its flora and fauna, and when that is all summed up and grouped together by an explorer who understands what he is doing, the result is a very important addition to human knowledge. It is some such addition as that that Dr. Bruce has made, and I can only hope that he may have further opportunities of pursuing such researches in the Arctic and Antarctic regions.

Mr. BUCHANAN: I am afraid that I cannot claim any acquaintance with Spitzbergen to compare with that of Dr. Bruce and Sir Martin Conway. I had pleasure, however, to be in the yacht of the Prince of Monaco in the first season that Dr. Bruce accompanied him into these icy seas, and His Highness held the opinion that he was the very best field naturalist that he had ever met. He knew all the animals and plants at a distance where other people could hardly see them, and I think when you saw his slides of birds and flowers, you must have recognized that he is also an artist in photography. I do not think that I should keep the meeting any longer, and I will only add that it has been a great pleasure to me to listen to his very interesting paper.

A cordial vote of thanks was proposed by the PRESIDENT, and was warmly repounded to.

Dr. BRUCE: There is no special remark to make, beyond the question of Sea Horse bay and Peter Winter cove. There is some doubt as to where Sea Horse bay and Peter Winter cove are; but if one looks at all the charts, in spite of the variety of their shapes and the irregular positions given, yet one usually finds Sea Horse bay and Peter Winter cove charted further south, and I think we shall find them to lie in that small portion of the coast that we have not yet been able to finish the survey of, namely, between Ferrier haven and Point Poole, south of which an anchorage lies. But it certainly is a point of doubt, and cannot be cleared up until charting of the east coast is finished. I have to thank you for your very kind attention.\*

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\* After further consultation with Sir Martin Conway, I have altered "Keerwyck" to "Freshwater bay." Both terms are vague. The Dutch applied Keerwyck to the region including Freshwater bay right across the sound, which they believed to be unnavigable if not non-existent. Freshwater bay is a later name, and was likely applied to that special portion of Keerwyck. Richard lagoon is named Vlak water on . . . . . map, but this appears only to be an indication that it is shallow water. I have named it definitely and after Dr. Jules Richard, director of the Oceanographical Museum of Monaco.

## RECENT LITERATURE ON THE PLAN OF THE EARTH.

By Prof. J. W. GREGORY, F.R.S.

THE last half-century has seen steady progress toward the attainment of the long-cherished hope of some satisfactory explanation of the plan of the Earth. The tetrahedral theory has been advocated in recent years, amongst others, by De Lapparent, Michel-Levy, Bertrand, Arlitt, and in a presidential address to the Geological Society of America by Emerson, while the writer in 1899 called the attention of the Geographical Society to that solution of the problem, suggesting some modification to adjust it to our increasing knowledge. During the last few years there have been several most important contributions to the subject from the mathematical side.\* This series of papers began with a memoir by Prof. J. H. Jeans on "The Stability of a Spherical Nebula" (*Phil. Trans.*, vol. 199, 1902, pp. 1-53), in which he advanced his theory of "gravitational instability." This theory is based on an application to the world of the universal principle—to him that hath shall be given. The denser portions of the Earth draw more material to themselves, and thus become still denser; and this process would continue, unless resisted by the elasticity of the material, until the redistribution had made the mass unstable. Prof. Jeans maintains that owing to this process the configuration of the existing planetary system cannot have been developed out of a rotating mass of liquid. He further tells us, that the general assumption that the condition of a gaseous nebula could be assumed by analogy from a similar rotating mass of liquid is not valid; for, in an incompressible liquid, gravitation tends to the stability of the mass, and rotation to its instability, whereas in a compressible gas, on the other hand, both rotation and gravitation may act together and tend towards instability, and the factor that resists these agencies is the elasticity of the gas. Hence both a gaseous nebula and a meteoritic swarm may be stable, and the planetary systems may have resulted from either; for a meteoritic swarm, as has been pointed out by Sir George Darwin, may be treated as a gas in which each meteorite represents a molecule.

In a second paper, "On the Vibrations and Stability of a Gravitating Planet" (*Phil. Trans.*, vol. 201, 1903, pp. 157-184), Prof. Jeans discusses the conditions of gravitational instability for a solid or fluid spherical planet, and investigates the conditions under which gravitation may displace material until such spheres become unstable. He considers that the evolution of the solar system and the throwing off of satellites from the planets have been due, not to the effects of rotation, but to instability in the structures of the parent planets

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\* Another addition to the series has been made by a posthumous paper by Lord Kelvin, just issued in the *Proc. Roy. Soc. Edinb.*, vol. 28, May, 1908.

caused by gravitational changes. This conclusion is advanced, as Prof. Jeans' calculations of the densities the planets would have, if due to gravitational instability, so closely agree with their actual densities. Prof. Jeans calculates that a body having the size and shape of the Earth will be unstable, unless it has approximately the elastic constants of steel; and this conclusion agrees with that accepted from Lord Kelvin's work on tidal deformation. Hence, with the accepted strength of the Earth, it would be stable in a spherical form; but the distribution of land and water shows that the Earth has not a full spherical symmetry, while gravitational disturbances would have prevented the Earth being spherically symmetrical at the moment at which it consolidated from a liquid condition. As it cooled and became rigid, the stresses in the Earth would become so great that the crust would be affected by a "series of ruptures, resulting from the stresses set up in the interior." "Hence the fact," he continues, "that the ultimate configuration is reached only as the result of a long succession of ruptures, puts the whole question outside the range of exact mathematical treatment." "We can, however, see that the final configuration (disregarding rotation) will probably not be quite spherical, but will retain traces of the initial unsymmetrical configuration." These traces of the original deformation Prof. Jeans recognizes in the pear-shaped form of the Earth, and consequent distribution of land and water. As Sir G. Darwin suggested in 1882, if the Earth's centre of gravity be further from England than the Earth's centre of figure, there would be a protruding land hemisphere in the northern hemisphere, and a projecting stalk of land to the south, and a waist occupied by sea. Prof. Jeans at first adopted the view that Australia, though not quite in the right place, was the projecting stalk, and the belt of oceans—the Pacific, South Atlantic, and Indian oceans—represented the sea in the waist of the pear; he admits that the theoretical arrangement does not exactly agree with the existing facts, and he warns us to remember "that our theory does not lead us to expect that the present figure of the Earth will be pear-shaped, but only that it will resemble a pear disfigured by a long series of ruptures."

The existing pear-shaped form of the Earth was about the same time advocated by Prof. Sollas ("The Figure of the Earth," *Quart. Journ. Geol. Soc.*, vol. 59, 1903, pp. 180–187), who argues that the Earth is pear-shaped, and that the pear has its stalk in the raised plateau of Africa and its flattened crown beneath the Pacific. This arrangement was accepted by Jeans, and has been supported in an interesting paper by Prof. Sacco ('*Les Lois Fondamentales de L'Orogenie de la Terre*' (Turin, 1906), 26 pp., map).

Prof. Love remarks that the pears of Sollas and Jeans "have little in common beyond the name." The orientation of the axis of the pear, which they accept, has the geographical disadvantage of not

agreeing with the results of pendulum observations, for they, as summarized, *e.g.*, in Steinhauser's map, indicate that the geoid differs from an ellipsoid by zones arranged around an axis which coincides with the Earth's axis of rotation.

Prof. Jeans' theory was based on an assumption, necessary for his mathematical treatment, which renders it applicable to an artificially simple globe, from which gravitation has been annulled by imaginary external forces, but not to the actual Earth. Lord Rayleigh, in a luminous discussion of the hypothesis ("On the Dilational Stability of the Earth," *Proc. R. Soc.*, vol. 77, 1906, pp. 486-499), points out the unnatural condition of Prof. Jeans' sphere. "How wide a departure from actuality," remarks Lord Rayleigh, "is here implied, will be understood if we reflect that under such forces the interior of the Earth would probably be as mobile as water."

Lord Rayleigh insists that a satisfactory treatment of the problem must start from the condition of the Earth as it actually is, *viz.* stressed by its self-gravitation; and he suggests that the difficulties in following such a course may not be so great as previous authorities have supposed. He points out that the pressure below the Earth's surface is hydrostatic, and that there need be no insuperable difficulty in considering the effects of such a pressure, even when so great as it must be beneath the Earth's crust, for the hydrostatic pressure will prevent the cracking and fracturing of the rocks subjected to it, which would flow instead of being fractured. To use the term familiar to geologists, following van Hise, the materials beneath the upper layers of the Earth's crust are in the zone of fluxion. Lord Rayleigh considers that, as owing to the force of cohesion liquids and solids are never free from stress, it may be possible to apply the usual equations for a body in a state of ease to matter in that zone of fluxion, which forms the main mass of the Earth. Lord Rayleigh suggests that it is, therefore, possible to find another and more practical basis for Prof. Jeans' analyses, for the hydrostatic pressure would keep the Earth in a state of natural equilibrium, and the artificial conditions introduced by Prof. Jeans may be dismissed as unnecessary.

Lord Rayleigh's treatment of the subject is geologically helpful, as, among other things, it strengthens faith in the efficacy of isostasy; for not only, as he points out, may an area of the Earth's crust rise, owing to the elasticity of the underlying material, when rocks are removed from the surface by denudation, but this uplift would be immensely increased by any instability resulting from internal gravitation.

Lord Rayleigh's principle that the Earth is kept in equilibrium by the hydrostatic pressure within has been adopted by Prof. Love, in three papers, in which he has developed and modified the theory of gravitational instability, and made it more attractive and useful

to geographers than the original form (A. E. H. Love, "The Gravitational Stability of the Earth," *Proc. R. Soc.*, vol. 79, pp. 194-200; *Phil. Trans.* vol. 207, 1908, pp. 171-241; "Presidential Address to Section 'A, British Association," 1907, 12 pp.; "The Figure and Constitution of the Earth," *Royal Inst.*, 1908, 15 pp.). He accepts the principle of gravitational instability, and also the conclusion that the Earth is now far removed from any state of gravitational instability which would only have existed at an early period in the Earth's history. Nevertheless, he thinks that movements of elevation and depression, due to gravitational instability, still dominate the Earth's geography. Prof. Love holds that the distribution of the depressions and elevations that have formed the oceans and continents have given the Earth, as a whole, a form that may be described as a harmonic spheroid.

He brings out the main facts in the distribution of elevation and depression by using the level of 1400 fathoms below the sea surface; this level divides the world into a raised area, the continental region, and two oceanic depressions, one being the Pacific, and the other consisting of the Atlantic, the Indian ocean, and the Southern ocean. The form of the Earth Prof. Love describes as "a harmonic spheroid of the third degree," and this can be compared to the shape of a pear. But Prof. Love's pear is a more complex form than that of Prof. Jeans, for, like a pear, it has a curved axis, a waist which is higher on the one side than on the other, a protuberant ring, and the upper surface is a flat crown, which is also askew. This extremely irregular form has developed because the Earth is not at rest, but is undergoing rotation, and has been deformed by the attraction of the moon. Prof. Love points out that Prof. Jeans' simple pear (with a straight axis, stalk, waist, and flattened top) represents that distribution of elevation and depression of the land that would be mathematically described as a harmonic spheroid of the first and second degrees; whereas the facts of geographical distribution require the more complex harmonic spheroid of the third degree. A distribution of land and water, according to the harmonic of the first degree, could be produced as a result of an eccentric position of the Earth's centre of gravity, which would lead to the concentration of water in one hemisphere, and of land in the other. The harmonic of the second degree is due to the ellipsoidal shape of the Earth, and the flattening of the poles. The harmonic of the third degree, due to radial instability, is more complex, but at the same time more helpful.

There are four subdivisions of the tertiary harmonic; the first is a zonal distribution of elevation and depression, producing alternate ridges and furrows around the Earth. They would form two belts of elevation and two of depression. If the south pole be assumed as on one of the belts of elevation, antipodal to it there will be the north

polar depression. The second tertiary harmonic divides these zonal belts into halves, which are alternately elevated and depressed; and the third tertiary harmonic will divide the Earth's surface into eight octants, alternately elevated and depressed, so that a map of the world would look like four squares on each of two rows of a chessboard. The fourth tertiary harmonic would divide the Earth into six meridional bands of alternate elevation and depression.

Prof. Love combines the four tertiary harmonics, noting where the elevations in each of them coincide; and he maintains that the resultant composite map of elevations and depressions due to the four tertiary harmonics gives the Earth a pear-shaped figure, in which the stalk is represented by the lands of Australia and Antarctica; the sea in the waist of the pear is represented by the Indian ocean; the mainland of the old world, and the former continents that probably existed over the South Atlantic, form the protuberant ring; and the North Atlantic is the ocean on the crown of the pear antipodal to the stalk. Where one harmonic elevation coincides with a depression on one of the other tertiary harmonics, there would be an area occupied occasionally by land, and sometimes by the ocean; and Prof. Love maintains that his harmonic distribution of elevation and depression thus explains the differences between types of Suess's two coast-lands, those of the Pacific and the Atlantic.

Prof. Love points out that the traces of the primary and secondary harmonics, which are all that are included in Prof. Jeans' pear-shaped spheroid, are not now conspicuous on the Earth's surface. Hence they have probably been slowly obliterated by those seismic and volcanic activities which are constantly at work, changing the level of the Earth's surface. These agencies, Prof. Love tells us, "tend, in the course of ages, to transform the shape of the Earth from one distinct type to another;" and this changing shape of the world, which, on such high mathematical authority, geologists may now accept, would cause periods in which the polar seas would rise, while the level of the tropical seas was lowered. The mass of evidence which Suess and Howorth have adduced as to the former greater height of the sea-level in the Arctic regions may, perhaps, be thus explained.

There are many points in Prof. Love's theory of gravitational instability which remind us of the suggestions made by geologists who have grappled with these problems. Prof. Love's octants of elevation and depression recall Prof. Lapworth's view that the continents are due to a series of intersecting, wave-like folds, causing dome-shaped elevations, alternating with oceanic basins. Prof. Love's theory has many points in common with the tetrahedral theory, which explains the tetrahedral plan in the distribution of land and water as due to the deformation of the Earth, in consequence of its contraction. The shrinkage was generally attributed to cooling, instead of to

gravitation, at least until the introduction of the planetismal theory. Shrinkage, however caused, was the essential point required by the tetrahedral theory.

Prof. Love now offers an alternative explanation of the deformation of the Earth's shape. The tetrahedral theory explained the present distribution of depression and elevation by reference to the fact that a tetrahedron has a very large amount of surface in proportion to its volume; hence, the Earth, like anybody with a hard shell that is shrinking owing to internal contraction, tends to flatten on four faces, as it thereby most easily gets rid of the excess of its surface dimensions. According to Prof. Love, the deformations that have caused the existing distribution of ocean and continent are due to early excentric position of the Earth's centre of gravity. This cause may not only produce the simple spherical harmonic of the first degree, but also the more complex form due to the spherical harmonic of the third degree; for the effect of rotation would be to fling the denser material further away from the axis of rotation, and thus cause the Earth's surface to rise and fall in a pattern conformable to a spherical harmonic of the third degree.

One serious limitation of the new theory is that, according to both Professors Jeans and Love, the gravitational instability can only have affected the Earth in its youngest stages. The Earth is now gravitationally stable, and the action of gravitational instability would have operated when the Earth, instead of being as rigid as steel, would have been as compressible as mercury or water. Gravitational instability, therefore, like the processes invoked in several earlier astronomical explanations of the Earth's topography, would have acted when the Earth was young. It would be satisfactory to those who believe in the permanence of oceans and continents, but not to those who are convinced that there have been fundamental changes in the distribution of land and water more than once during geological history. The plan of the Earth, if due to gravitational instability, should have been better marked in earlier geological times than it is at present. Any satisfactory theory must allow of alternate periods of deformation and of spheroidal recovery, both due to the unceasing shrinking of the Earth. One of the attractive features of Prof. Love's theory, however, is that the spherical harmonics of the third degree are not limited to only one configuration of ocean and continent; a different grouping of the various sub-orders would produce a different arrangement of elevation and depression. Hence, although the distribution of land and water on the earth in Upper Palæozoic times was very different from the present, it may still be described in terms of harmonic movements.

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# NOTE ON A SURVEY FROM GREEN BAY, NORTH-EAST COAST OF NEWFOUNDLAND, TO BONNE BAY, ON THE WEST COAST.

By H. C. THOMSON.

IN the year 1878 the Government of Newfoundland caused a preliminary survey to be made of the route for a proposed railway from Green bay (one of the great inlets of Notre Dame bay), on the north-east coast of Newfoundland, to the Humber sound (one of the arms of the Bay of Islands) on the western coast. The report of Mr. Charles Harvey, who made that survey, is contained in the *Journal* of the House of Assembly for 1879, but the plans and maps which went with it were unfortunately destroyed in the great fire which took place at St. John's in 1896.

The project of a railway to run from Green bay to some point on the western coast of the island has recently, however, been revived; and last year a survey was made under the direction of Mr. Elliott-Cooper as consulting engineer, which resulted in a practicable line being found between Green bay and Bonne bay, an extensive land-locked fiord lying some little way to the north of the Bay of Islands, which, for many reasons, has been preferred for the western terminus. The survey was made for Mr. Elliott-Cooper by Mr. Bruce, assisted by Mr. Mostyn, who were accompanied by myself. The nature of the country is shown by the sketch-map of the route selected, and by the accompanying photographs taken at different places along it.



BIRCHY POND.

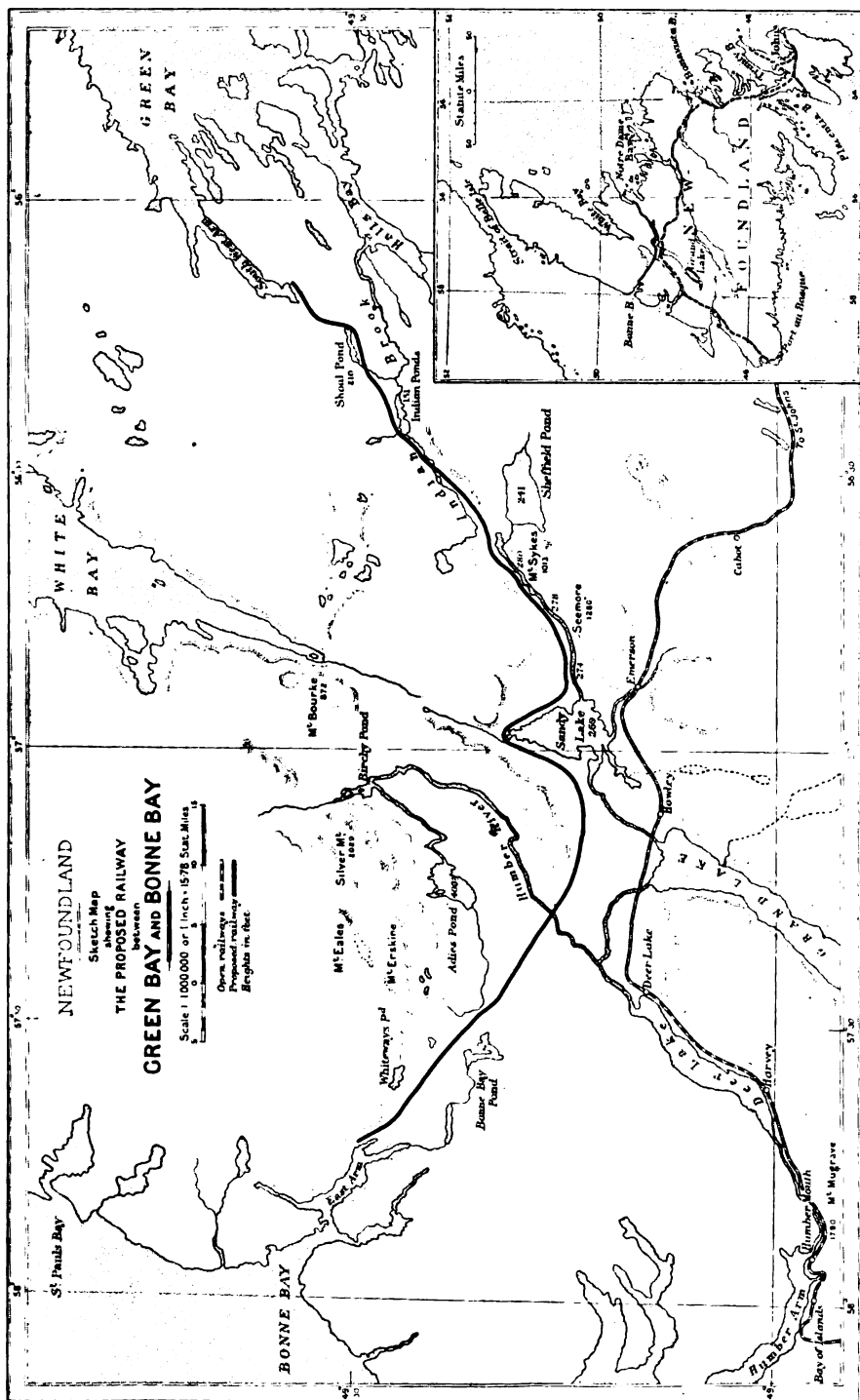


BELOW RAPIDS, BIRCHY POND.

Green bay is a long narrow inlet, the most western of all the bays with which Notre Dame bay is serrated. It is rather over 12 miles in length, and terminates finally in a cove known as "King's Cove," which forms an almost perfect harbour sheltered from the wind on all sides, and deep enough to afford anchorage for ships of any tonnage. On the northern shore the hills, which are over 1000 feet in height, rise almost precipitously from the water's edge, whilst on the south side the country slopes gradually away into a series of rounded ridges and hills, originally clothed with dense forest, but devastated a year or two ago by one of the forest fires which have done so much injury in Newfoundland. The cove ends in a fairly wide, level, and thickly timbered valley, through which a rough overgrown track leads to Shoal pond,  $6\frac{1}{2}$  miles away.

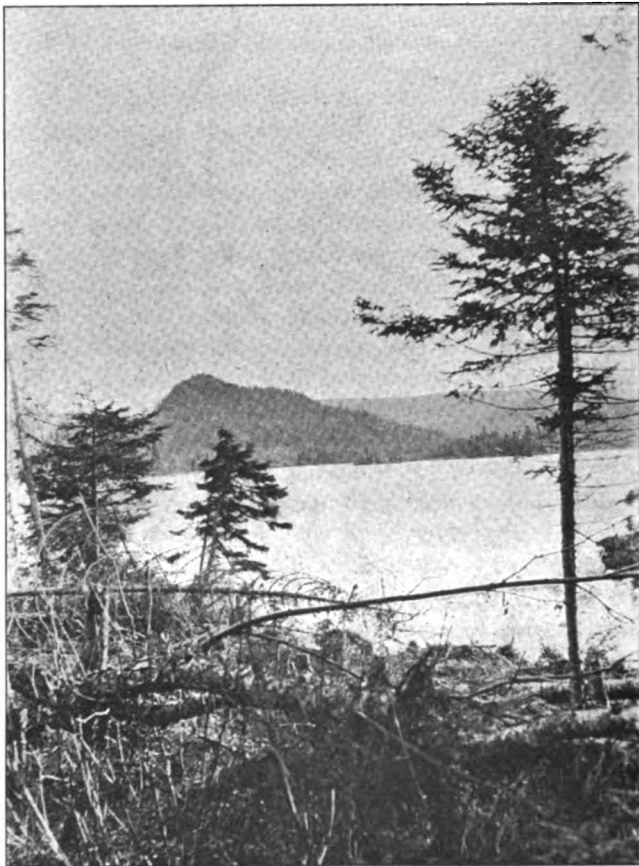
Bonne bay is a similar deep land-looked fiord 8 miles in length, only the scenery is infinitely grander—the country immediately surrounding it being the highest land in the island; the White mountain, the highest point of all, being 2540 feet in height. •

The line between these two bays runs along a succession of lakes; one series lying along the course of the Indian creek to the watershed, which is met with 28 miles in from the sea; and another series, known as Birchy pond, through which flows the eastern tributary of the river Humber, which takes its rise in a large lake to the east of Birchy pond, known as the Sheffield pond. At one time the greater part of the country was heavily timbered; now large tracts have been completely devastated by fire, giving that part of the country over





**GOOSE LAKE CAMP.**



**BONNE BAY LITTLE POND.**



VIEW OF PORTION OF VALLEY, ABOUT 2 MILES INLAND, THROUGH WHICH THE PROPOSED RAILWAY DESCENDS TO SOUTH-EAST ARM, BONNE BAY.

which the fire has swept a very forbidding and desolate appearance. Along Birchy pond, however, there have been comparatively few forest fires, and the scenery is exceedingly beautiful, what is known as Birchy pond consisting of one long narrow lake, 14 miles in length, which contracts at two points so as to form what looks like three separate lakes. In its widest place this lake is not more than 1 mile in width, and at both the places where it narrows it is little more than 70 or 80 feet; the division being caused by a shelving rim of shingle separating the lake into three distinct basins. On the northern side the hills rise fairly precipitously, and are densely wooded, but on the south a stretch of sloping land or foothills intervenes between the lake and the hills, which on that side are in some places bare and rocky, the formation for the most part being a dark-coloured purple serpentine. The marshes, as a rule, are shallow and could be easily drained, firm ground being generally obtained with a pole at a depth of from 3 to 4 feet. There are comparatively few deep bogs, the marshes being merely a sponge of moss filling up the hollows of the underlying rock.

A telegraph line runs from Green bay to the Grand lake, skirting the southern shores both of the Indian ponds and of the Birchy pond. The telegraph repairers have erected rough log camps here and there; otherwise this part of the interior is absolutely uninhabited; nor, so far as we were able to judge, does it seem capable of much cultivation,

the soil being scanty, and in many places practically absent—miles of calcined rock being disclosed where the fire has burnt off the covering of moss. The lakes are shallow, with a singular absence of weeds and mud, the shores and bottom being composed of loose granite pebbles brought down in the spring freshets by the numerous little streams which run into them from the high ground on either side.

There was a curious absence both of bird and of animal life, due probably to the poverty of the soil, and to the consequent scarcity of food. We were glad, however, to come upon several inhabited beaver-houses, showing that the Act passed some years ago, prohibiting the killing of beavers under severe penalties, had to some extent effected its purpose. It will, nevertheless, have to be extended for a considerable period if these delightful little animals are to be preserved from extinction, for at the present time every beaver-house is jealously watched by the trappers, or "furriers," as they are called in Newfoundland, and directly the prohibition is removed the beavers will be killed off almost at once. Caribou were plentiful about Sandy lake, and we came upon one or two bears, which are now becoming very scarce in the island. Upon two occasions at Indian lake we heard wolves howling at night. They are said to be nearly extinct in Newfoundland. The timber, though thick, was on the whole small. It consisted of the tamarack (*Larix occidentalis*), the aspen (*Populus tremula*), and of different species of spruce, pine, and birch.

The survey party started from St. John's for Green bay on August 16, the weather then being warm and fine. Early in September stormy weather set in, with high winds and heavy rain, continuing almost without intermission until the last week in October, when there was



DEER ARM, BONNE BAY, SHOWING GEOS MORNE, OR WHITE MOUNTAIN, 2540 FEET, THE HIGHEST MOUNTAIN IN NEWFOUNDLAND.

a heavy fall of snow with a sharp frost. This was followed by a thaw which left the country in so sodden a condition that further work was impossible, the detail survey at that time having reached the northern angle of Sandy lake. All that could be done was to go rapidly across to Bonne bay, and to examine the approaches to it from the interior, and decide upon the most suitable place for a harbour. This was found to be in what is known locally as the South-East Arm, a deep, perfectly

sheltered basin with good anchorage, three-quarters of a mile in length and half a mile in width. We left Bonne bay by steamer for the Bay of Islands early in November, the weather then being fine and bright but cold, the thermometer one night registering 12° of frost. There was even then, in the absence of wind, a thin coating of ice over the coves where the rivers bring in fresh water, but the bay itself does not freeze up until the end of December, or the middle of January.

## REVIEWS.

### EUROPE.

#### POMERANIA.

*Geologie von Pommern.* Von Dr. W. Deecke, Ord. Professor der Geologie und Paläontologie an der Universität Freiburg i. Br. Mit 40 Textabbildungen. Berlin: Verlag von Gebrüder Borntraeger. 1907. Pp. 302. Price 9.60m.

THIS work is the result of investigations pursued during thirteen years while the author held a post at the University of Greifswald. There still remain questions he would have liked to study more fully, but being called away to a professorship at Freiburg, he has published the abundant material he has collected while it is fresh in his memory. The province of Pomerania, 11,628 square miles in area, belongs orographically to the Baltic ridge, which, at the bend it makes in crossing the Oder valley, marks the boundary of two very unequal divisions—Vorpommern and Hinterpommern. The Baltic ridge enters the province near Lauenburg with heights of over 650 feet, and runs at first from north-east to south-west, turning at Kallies to a more westerly direction towards the Oder. It is a somewhat gentle undulation, with a rather irregular crest-line. The higher parts of Hinterpommern consist of a labyrinth of domes, hills, and conical heights, very irregularly disposed, though collectively maintaining the north-east to south-west direction; and the same configuration, though in a modified form, extends to the lower parts of the country. The hydrography corresponds to the relief. Except the Oder, which cuts its way from the south through to the Baltic, all the streams of Pomerania flow from the heights northwards to the Baltic, or, in Hinterpommern, southwards to the Netze, with sharp bends in their courses. There are a large number of lakes, pools, and ponds, many over 20 square miles in area, which lie in two zones, one immediately on the coast, the other on the broad back of the Baltic undulation. All the morphological peculiarities of the province are explained by the geological structure.

Formerly it was supposed that the province consisted solely of Tertiary deposits and diluvium, but during the past thirty years much information has been obtained by borings, executed in search of water and for other purposes, by a careful study of glacial detritus and boulders, and by a closer examination of neighbouring regions; and it has been ascertained that all the rock formations from the uppermost Permian (Upper Zechstein) occupy extensive areas beneath the visible diluvial covering. Of pre-Permian formations—Silurian, Devonian, Carboniferous—nothing definite is known, and Dr. Deecke can only set forth the geological history of adjacent districts during these periods. The other formations he describes very fully, with lists of the fossils found in them, and bibliographies relating to each period. In recent deposits remains of the reindeer, Irish elk, urus, etc., and traces of man have been found. The formation of the moors in the main valleys is

ascribed to the *Ancylus* period. No traces of the *Yoldia* period have been found, and those of the *Litorina* sea are very few.

#### ICELAND.

'Island in Vergangenheit und Gegenwart.' Reise-Erinnerung von Paul Hermann. Erster Teil: Land und Leute. Zweiter Teil: Reisebericht. Leipzig: Verlag von Wilhelm Engelmann. 1907. Pp. 376 + 316. *Map and Illustration.* Price 15m.

Iceland has of late years attracted to its shores a large number of geologists, mountain-climbers, and sportsmen and tourists, and their narratives have made us much more familiar with the natural features of the island and its inhabitants. The chief merit of the present work is that it brings together in two volumes of moderate size information on various subjects. The first volume chiefly consists of chapters on the history, geography, and geology of the island, and the industries, arts, and culture of the inhabitants, compiled from numerous authors, old and recent; while the second part, narrating the author's ascent of Hekla and his journey along the south coast and northwards to Akureyri, is also interspersed with numerous extracts—legends, descriptions of eruptions, poems, and other gleanings. A more strict separation of the various subjects might from some points of view be more advantageous, but a good index makes it easy to find any desired information, and the actual arrangement is better suited to the taste of the general reader. Of the present state of Iceland the author speaks in very favourable terms, conveying the impression that it is a home of refinement and art. He speaks with great approval of the educational system, judging, however, only by the results shown at examinations he attended. For the moral state of the Icelanders he has nothing but praise, and asserts that drunkenness is almost entirely confined to foreigners, especially Englishmen, though he admits that the country farmer avails himself to the full of the few opportunities he has to get drunk. Cleanliness he met with everywhere; nor does he complain of the foul atmosphere of the *Bathstofa*, as most travellers do. In fact, he was thoroughly pleased with all his experiences. Certainly there has been of late years great improvement in the condition of the Icelanders, and in some respects he no doubt compares not unfavourably with peoples living in more fertile lands with a climate more genial, but Prof. Hermann's picture seems rather too highly coloured. Perhaps two or three more visits to Iceland would induce him to modify his opinions. For the rest, his work is an interesting sketch of Iceland and its inhabitants in ancient and modern times, and the narrative of his journey contains good descriptions of the country and life in remote districts of the island.

#### ASIA.

##### A JOURNEY ACROSS CHINA.

'From Peking to Mandalay.' By R. F. Johnston, M.A., F.R.G.S. London: Murray. 1908. *Map and Illustrations.* Price 15s. net.

The author, as district officer and magistrate of Wei-hai-wei, was well qualified, both linguistically and by travel in other parts of China, to undertake the expedition described in the present work. In 1902 he had journeyed through Tongking, Yunnan, the Chinese Shan States, and down the Mekong to Siam; and in 1904 he had visited several of the provinces of Eastern China, and had even inspected the tomb of Confucius, and been presented to the seventy-sixth descendant in a direct line of the great philosopher and saint. The last and more ambitious tour was begun in January, 1906, the main object of the author being to explore the principalities of Eastern Tibet that now own allegiance to China, and thence to proceed southwards to Yunnan and Burma. Instead of ascending the Yangtse to Hankow and Ichang, Mr. Johnston followed the more interesting Lu-han railway

route that the completion (a few weeks previously) of the famous bridge across the Yellow river had made possible. He was thus enabled to reach Hankow, 759 miles from the capital, in three days. The journey thence up-stream, past Ichang, is, of course, well known; at Wan-hsien the great river was abandoned, the hardy boatmen paid off, and the land journey to Chengtu-fu commenced. Here and elsewhere it is gratifying to note the uniformly good behaviour shown to the author; even at Liang Shan, where the late Mrs. Bishop was mobbed and so seriously knocked about, he found the people orderly and good tempered. At Chengtu-fu and elsewhere light was shed on some of Mr. E. C. Baber's researches, not the least interesting points referred to being the temples and the prehistoric cave dwellings of Chiating, and the wonderful fascination of Mount Omei, the highest precipice in the world, with its strange atmospheric phenomenon of a gleaming aureole, the "Glory of Buddha." Pilgrims are expected to have certificates sealed at the summit as proof of their having visited the sacred place; probably the European notion of sending off postcards from the topmost monastery may eventually prevail. At Ta-chien-lu the author had to carefully consider his further route, and eventually, after encountering great opposition from the local authorities, decided to diverge from the Batang road and explore the Yalong valley and the mountainous road south-west of Ta-chienlu. Along this section of the route his only predecessors had been M. Bonin and Mr. Amundsen. The inhabitants of these parts seem all Tibetan, for between Cheto and Likiang in Yunnan—about a month's journey—the author did not meet a single Chinese, even the language being entirely unknown. At Muli, which looks strangely like a bit of the Austrian Tyrol, Captain H. R. Davies's route was struck, and European associations were further called up by the excellent chanting of the monks in the lamasery, which reminded Mr. Johnston of Palestrina. A little further south the remarkably acute bend of the Yangtse was reached, a geographical feature only revealed to science within the last ten years. At Likiang a French gentleman, engaged in the purchase of musk, was met, and from thence to Tali-fu and the Burmese frontier is fairly well-trodden ground. Mr. Johnston's return to Wei-hai-wei was by sea. His familiarity with Chinese, and careful study of ethnological and other questions, and of the native literature, invest his notes with special value, which would hardly attach to the researches of an ordinary traveller, while his concluding chapter contains some exceedingly well-weighed and instructive reflections on the relations between China and Western nations.

### AFRICA.

#### THE ASWAN CATARACT.

J. Ball, 'A Description of the First or Aswan Cataract of the Nile.' Survey Department, Egypt. Cairo, 1907. 121 pp., xiii. pl., and 20 figs. *Price* 200 *millièmes*.

The first cataract of the Nile is a locality of exceptional interest in the history of geography, as it was the southern end of the base line which extended northward to Alexandra, used by Eratosthenes in his measurement of the Earth. Dr. Ball opens his interesting monograph on Aswan by an account of the methods used by Eratosthenes and explanation of the comparatively slight error in his results. The literature of the locality goes back even earlier than the classical geographers, and Dr. Ball's comprehensive bibliography begins with Ezekiel and ends with Baedeker. The district is also famous geologically, as it includes the granitic rocks of Syene, which has given to petrology one of its best-known names. This rock and some of those associated with it are illustrated in the report by a series of beautiful coloured plates of polished specimens.

Aswan has been brought into prominence in recent years by the Aswan dam,

and the great reservoir that contributes so greatly to the productiveness of Lower Egypt. The position of the dam and the areas occupied by the reservoir at different water-levels are shown in the topographical map that forms the frontispiece to the memoir. The author corrects a popular misconception as to the function of the Aswan dam, which does not control the Nile flood. The full flood sweeps through its arches unchecked, and it is only in December, when the river-level has fallen, that the gates of the reservoir are closed; the water accumulates above the dam until February, when the supply thus caught is allowed to discharge and maintains the flow of the river during its lowest period.

Geologically the country around the first cataract consists of a base of granitic and schistose rocks and gneisses, for which the author's determination as Archean may be accepted with little hesitation. The ancient rocks are covered by a sheet of Nubian sandstone, which (as the writer suggested at the Geological Society in 1892) is to be regarded as partly of Carboniferous and partly of Cretaceous age.

Dr. Ball gives a further account of the Nile mud, which has been described by Prof. Judd. Dr. Ball divides the silt of the Nile into sand and mud, which consists essentially of chemically unaltered fragments of igneous rocks. It is nevertheless an ordinary clay, for it has the physical properties of a clay, though it does not consist of kaolinite. The author uses the term "clay" as if the essential quality of a clay depended upon chemical composition. He says the plasticity of this material when moist makes "one think of clay," and he remarks (p. 63) that it may be called clay in an agricultural sense, but that it has very little of the materials "which are classed as clays by the mineralogist." But the mineralogist has no right to appropriate the old English term of clay to a few exceptional and proportionally insignificant varieties of the clays, and geologists now generally admit that the essential properties of clay are physical and not chemical. Dr. Ball attributes the plasticity of the Nile clay to the irregular size of the constituents, and there is certainly much to be said, in many cases, for that explanation; but that it is not the universal cause of plasticity in clays is shown by the fact that the clay of Albany co., in Wyoming, though its grains are very fine and uniform in size, is fully plastic.

The author's account of the geographical history of the Aswan fall is of great interest; as is well known, the fall is only a cataract, by which the river-level is lowered 5 yards in about 5 miles. But owing to the great volume of water rushing through the narrow rocky channels, the current sometimes carries along boulders weighing several tons. Dr. Ball attaches great importance in river erosion to the action of pot-holes, and refers to the views of Prof. Bruhnes, based on observations on the Nile at Aswan, that pot-hole formation is the most important process in the wearing out of river gorges.

The Aswan cataract is geologically modern, as the Nile did not occupy its present channel till late Pliocene times, and the Nile alluvium is all Pleistocene; and the last of the migrations of the Nile, such as that which has left the dry valley now used by the railway from Shellan to Aswan, are only just prehistoric. It is, therefore, interesting to find that these changes in the position of the river were due to earth-movements; Dr. Ball attributes them to Pleistocene faults which are among the youngest known in Egypt. They were probably of the same age as many of the faults which border the Rift-valley in equatorial Africa. The actual river channel the author recognizes as due to erosion, but the river action was guided by the fault lines. Another interesting outcome of Dr. Ball's survey is that the volume of the Nile has not sensibly diminished within historical times, or say within the last eight or ten thousand years (p. 104).

The last page in this very suggestive memoir calls attention to the effect of

diurnal variations of temperature in producing gorges by the expansion of clefts, by movements analogous to those assumed in Moseley's explanation of the flow of glaciers. Dr. Ball calculates that a block of limestone 10 metres long, and subject to a daily change in temperature of  $1^{\circ}$ , would creep down a slope a metre in fifty-five years. Sandstone would move twice as fast. The author thinks that a diurnal range of  $1^{\circ}$  may be accepted for a rock mass, as the change in temperature of the surface may in the summer be as much as  $50^{\circ}$  Centigrade. This cause must undoubtedly have some of the influence assigned to it by Dr. Ball, though it would be greatly limited by the low thermal conductivity of rocks. Dr. Ball uses it to explain the peculiarities of some khors and wadies, at the head of dry valleys which cannot be attributed to erosion by water, owing to the smallness of the drainage area.

J. W. G.

#### THE BUSHMEN.

'Die Buschmänner der Kalahari.' By Dr. S. Passarge. Berlin: 1907. Pp. vi. + 144.

Of the numerous monographs issued by Dr. Passarge on South African subjects, not the least attractive is this masterly essay on the Bushman aborigines. It is mainly the outcome of observations made during several months' residence in the central parts of the Kalahari desert, where these wild nomads can now be best studied, being here farthest removed from contact with the more civilized Bantus and other surrounding peoples. A careful perusal of the essay leaves the general impression that the popular views regarding their low social status will have to be reconsidered. They are commonly described as destitute of all social organization, with no chiefs elected or hereditary, no religion or burial rites implying a belief in immortality, no marriage ceremonies or family ties, no industries, no dwellings beyond a trench dug under some sheltering bush, and especially no tribal or even stable family groups, but only the rudimentary elements out of which an organized community might be gradually evolved. But Dr. Passarge reverses nearly the whole of this picture, and, without denying that the Bushmen are, and always have been, pure nomads, clearly shows that they are constituted in regular tribes and sub-tribes with their several petty chiefs, all subordinate to a paramount head chief. Various reasons are given to explain the admitted fact that no mention is made of chiefs by Burchell, Campbell, Moffat, Hahn, Baines, and the other early writers, or by any observers before Sechinz, and he only speaks alightingly of the heads or leaders of a few wandering hordes. But here the very names are given of real chiefs and head chiefs still surviving amongst the Aikwe, the Aukwe, and some other Kalahari groups. There are even distinct tribal marks tattooed on the body, and three different styles of tattooing are mentioned: one ornamental, one tribal, and one magical, endowing the recipient with the swiftness of the antelope. Then a long description is given of the hitherto overlooked burial rites, at which arms, implements, clothes, and food are deposited with the dead, and other indications given of a belief in an after-life, and of ancestor-worship as the central point of the Bushman religious system. For him death itself is merely a prolonged sleep, and the surrounding sepulchral cairns are the haunt of the sleepers, that is, of the souls of the departed, some well disposed, some hostile to the living, hence needing propitiatory offerings. Here we have the elements of all primeval cults as fully developed as amongst most other primitive peoples, and after this the Bushman nomads should no longer be described as "disorganized hordes going about like packs of baboon in quest of food." The usual references are made to the remarkable Bushman pictorial art, and the reproductions here given of copies made by the author himself in the

Kalahari, where none had been suspected, are vindicated from the charge of being mere caricatures brought against him by the rival explorer Gustav Fritsch. It is noteworthy that the rhinoceros, eland, giraffe, hyæna, occasionally even man himself, are depicted, but never the elephant, for some unexplained reason, possibly connected with an incipient totemic system.

The monograph, with its vivid descriptions of Bushman daily life—hunting scenes, feasting, dancing ending in orgies—makes very pleasant reading, and will, at the same time, be appreciated by anthropologists for the new light it sheds on the social standing of these aborigines.

A. H. K.

#### EGYPTIAN BOUNDARY SURVEY.

Report on the Delimitation of the Turko-Egyptian boundary in the Sinai peninsula. June—September, 1906. By E. B. H. Wade, Survey Department of Egypt. National Printing Department, Cairo. 1908. Price 150 *ml*.

The necessity for this delimitation arose from the encroachments of the Turks into Egyptian territory, and the claim put forward by the Turkish Government to the greater part of the Sinai peninsula.

After considerable pressure by the Imperial Government, the Turkish Government acknowledged Egyptian rights and agreed to delimit this boundary. It was considered desirable to settle the matter at once, and the chief interest in these operations lies in the special conditions under which they were undertaken, thus defined by the Director-General, Egyptian Surveys.

"It was necessary that the operations should be completed as rapidly as possible, and that the results should be of considerable accuracy, but the local conditions in the summer months rendered it impossible to employ a network of triangulation points. The frequent dust-haze, the unsteadiness of the marks seen over the heated surface of the desert, the distortion of natural objects by mirage, and other difficulties due to working on a heated desert plateau, rendered it necessary to employ such special methods as would reduce the errors due to these special conditions as much as possible. It was therefore decided to determine the latitude of a number of intervisible points and the azimuths of the lines joining them; then to obtain the longitude of the terminal point at Rafa by exchanging chronometer signals telegraphically with the Helwan Observatory near Cairo.

"In the present case a line of 210 kilometres was delimited in thirty-one days, fourteen points being fixed. The demarcation by permanent signals, which have since been replaced by masonry marks, occupied fifteen days."

This rapid piece of work, costing only £460 E., was efficiently carried out by Mr. Wade, and the report gives his diary and calculations, with a discussion of the results obtained, forming a useful guide to others contemplating rapid work of similar nature.

Some interesting notes on the topography of the boundary are added, together with a map on a scale of 1 : 500,000.

A considerable amount of cultivation was met with in the neighbourhood of water; chiefly barley, tobacco, and dura, and the presence of water constituted the value of a locality. It is found at Agaba, Taba, the Wadi Maysin, where numerous flocks of goats and sheep are watered, Ain Qadis and Qoseima, both abundant supplies, Wadi Hanein, the site of numerous ruins, and Rafa. A table of places and water-supply is given by Mr. B. F. E. Keeling, who conducted the topographical sketching.

Mr. Wade recalls the fact that Palmer, in his book, 'The Desert of the Exodus' (London, 1871), identifies the plain of the Wadi el Gefi with the Mosaic wilderness

of Kadesh, and the Ain Qadis with the waters of Meriba. He also points out, that Palmer described Ain Qadis and Ain Qossima as having water only in the rainy season, whereas both places had abundant supplies from perennial springs when visited by the Boundary Commission in June.

E. P. B.

#### GERMAN EAST AFRICA.

'Zur Erwerbung von Deutsch-Ostafrika: ein Beitrag zu seiner Geschichte.' Von Dr. Joachim Graf v. Pfeil. Berlin: Verlag von Karl Curtius. 1907. Price 6m.

Count von Pfeil was one of the founders of German East Africa, and has every right to the distinction which that fact affords. In a book of 232 octavo pages he retells the story of the acquisition of the colony and its subsequent history, with the special object of making clear the part he played in 1884-87 in view of statements by Dr. Carl Peters, tending to claim for himself (Peters) the whole merit of adding the country to the German Empire. The author also gives interesting details concerning his previous experiences in South Africa, dating from 1873. Incidentally he describes the present condition of German East Africa, which he holds to be such as to justify its annexation and development by his countrymen. But the most remarkable thing about the book is that it is not divided into chapters, nor supplied with an index, and lacks even descriptive headings to the pages. On the other hand, a few interesting photographs are given.

F. R. C.

#### SOUTH-WEST AFRICA.

'Elf Jahre Gouverneur in Deutsche Südwestafrika.' Von Theodor Leutwein. Mit 176 Abbildungen und 20 Skizzen. Ernst Siegfried Mittler und Sohn. Berlin: 1908 [1907]. Price 11m.

General Leutwein's story of his governorship of German South-West Africa adds materially to the existing knowledge of that country. It is mainly historical, covering the period 1892-1904, but there is a good deal of information concerning the native races, including a very interesting chapter in which the careers of Hendrik Witbooi, Samuel Maherero, Morenga, and other notable "captains" are sketched. Another chapter is devoted to the Ovambos, of whom comparatively little is known. Attention is also devoted to the climatic conditions and to the economic resources of the country, to its trade and commerce, to the work of the missionaries, and to the administrative organization. The book demonstrates that, notwithstanding many mistakes, and many difficulties for which the Germans were not responsible (such as the rinderpest), much has been accomplished in the way of opening the country. As has been said, the interest of the book is mainly historical, and it will come as a surprise to learn that even before the beginning of the Herero war, in 1904, the country was scarcely ever at peace. No fewer than seven "insurrections" are recorded between 1892 and 1901. The book is beautifully illustrated, and the sketch-maps and plans, though rough, are adequate for their purpose. It is a pity that the book, which contains much to interest readers outside the "Fatherland," should appear in German type. The leaded paper makes it also somewhat cumbersome to handle.

F. R. C.

#### AMERICA.

##### GEOLOGICAL HISTORY OF TROPICAL AMERICA.

'Archhelenis und Archinotis: Gesammelte Beiträge zur Geschichte der Neotropischen Region.' By Hermann von Ihering. Leipzig: W. Engelmann. 1907. Pp. iii. and 350. Map and Fig. Price 5m.

In republishing in a collective form the essays (together with such new matter as was necessary to connect and explain them) which go to form this volume, No. II.—August, 1908.]

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the author has been well advised, since they include a large amount of evidence in favour of the view that South America and Africa formed a more or less continuous land-mass down to a comparatively late period of the Earth's geological history. Accepting, to some extent at any rate, the theory of an early Mesozoic "Gondwanaland," Dr. von Ihering considers that during the Jurassic epoch the land-surface of the globe (apart from what may have existed in Antarctica) was aggregated into two great continental areas, namely, one embracing what is now Europe and Asia, which had connections with North America and Australasia; and a second comprising Africa and a large part of South America. According to the generally accepted view, this Ethiopio-Brazilian continent was encroached on during the Cretaceous by what is now the South Atlantic, but the complete severance between Africa and Brazil did not take place till Eocene times. This view is supported by our author, whose map shows "Archhelenia," as he terms the united continent, stretching in Eocene times from India and Madagascar to Brazil and Uruguay, and thus to the present west coast of South America, with apparently some interruptions in the shape of shallow archipelagoes. When the connecting bridge disappeared, presumably during the Eocene, "Archiguiana" and "Archibrazil," which were separated by the submergence of the lower Amazon valley, became isolated, but "Archiplata" (Patagonia) may have been still able to receive immigrants from one of two sources, viz. either from North America by way of the Andes, or from Australasia.

In the main, this view (which is largely based on the evidence of molluscan evidence, both fresh-water and marine) accords with one expressed by Prof. C. Eigenmann (based on fish-evidence) in the *Popular Science Monthly* for June, 1906. "In the earliest Tertiary," it is there stated, "tropical America consisted of two land-areas, Archiguiana and Archamazonia (equivalent to the Archibrazil of Ihering, by whom Archamazonia is employed to denote Archiguiana and Archibrazil), separated by the lower valley of the Amazon, which was still submerged. There was a land-mass, Helenia (= Ihering's Archhelenia), between Africa and South America, possibly in contact with Guiana and some point in tropical Africa." This intermediate area, continues Prof. Eigenmann, was the home of the families of fishes now common to Africa and South America; and as the central land sank the eastern and western elements of the fauna became more and more sundered, and eventually formed the respective sources of the faunas of the two continents.

Some discussion is devoted in the volume to the question as to whether South America was completely isolated from the countries to the north till the late Miocene; but space prevents further allusion to this point, or to the consideration of the changes which have taken place in the land-area of South America itself. It is, however, noteworthy that in the map North and South America are represented as isolated during the early Eocene. With regard to "Archinotis," or Antarctica, Dr. Ihering is of opinion that this remained in connection with Archiplata by way of the Falklands and South Georgia, not only during the Mesozoic, but into the Eocene, and that to the eastward South America was thus brought into connection with Australia and New Zealand. This being demonstrated, he asserts, by the evidence of the marine molluscs and brachiopods.

Although opinions must naturally differ as to how much or how little of his views are to be accepted, there can be no doubt that in the series of articles collected in this volume Dr. Ihering has made a most important contribution to the past geographical history of South America, and has established almost beyond argument proof of the comparatively late date down to which that continent was joined to Africa.

R. L.

## BIRDS OF TIERRA DEL FUEGO.

'The Birds of Tierra del Fuego.' By Richard Crawshay, Captain, Reserve of Officers, late Inniskilling Dragoons. London: Quaritch. 1907. Price £4 4s.

This is essentially a bird book. But it has a geographical flavour, being concerned with a special locality, and we may devote a few remarks to it.

Just as England was peopled with birds from the continent of Europe, so Tierra del Fuego, at the extreme southern end of America, was furnished with feathered inhabitants from the adjoining mainland of Patagonia and Chile. Of the eighty species mentioned in Captain Crawshay's volume, not one is peculiar to Fuegia. All have come from the north, some from the eastern and others from the western side of the Andes; most of them, indeed, are found on both coasts. For Patagonia we have as a guide Sclater and Hudson's 'Argentine Ornithology,' and for Chile the last reliable authority is James's 'New List,' published in 1892. In the former are enumerated 492 species; in the latter, 255, so that we can see at a glance that Fuegia is a poor country for birds, as might have been expected from its terrible climate.

Besides serving his country most effectually both in his military and civil capacities, Captain Crawshay has by no means neglected his scientific opportunities, and has written some useful papers on mammals. But we are not aware that he has previously turned his attention to birds, although it is evident from his field notes that he has an observant eye for this class of animals also.

In a well-written preface, which extends to some thirty pages, Captain Crawshay has given us an instructive sketch of the physical peculiarities of Tierra del Fuego, and has mentioned the principal travellers who have investigated them. Amongst these Darwin, in his 'Naturalist's Voyage,' stands pre-eminent, but King's descriptions of the scenery are "particularly powerful and vivid." Captain Crawshay describes in his preface the leading features of the geology, botany, and zoology of this extreme portion of the Neotropical Region, and then proceeds to the birds, which are the main subject of his work. The most striking forms of the Fuegian avifauna are illustrated by twenty-one excellent coloured plates, prepared by Keulemans, the best ornithological artist of the present time. A series of 'Landscapes,' which shows the scenery amongst which the birds are met with, is also given. We are told that birds are by no means plentiful in Tierra del Fuego, and we can quite understand that the author, who made his specimens with his own hands, had by no means an easy task to get his collection together. But the result of his labours is a handsome volume, which does credit to the author and the publisher, and will be very useful to the naturalist, if not to the geographer.

P. L. S.

## POLAR REGIONS.

## AMUNDSEN'S 'NORTH-WEST PASSAGE.'

'The North-West Passage.' By Roald Amundsen. 2 vols. London: Constable. 1908. Price 31s. 6d. net.

Ronald Amundsen is one of those consummate seamen of a type very frequently found in the Scandinavian countries, who combine audacity with forethought. His experience in the Antarctic ice, and his previous cruises in the northern seas, qualified him for the great task he had undertaken. This was to institute magnetic observations round the position of the pole as indicated by Sir James Ross, and, if possible, to make the North-West Passage. Funds were limited and hard to obtain. Much was due to the active help and sympathy of Dr. Nansen, and there was hearty encouragement from Dr. Neumayer. The selection of a Hardanger

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fishing-boat, no longer in her first youth, was fully justified by the event; and the excellent little motor, worked with petroleum, proved a success. Seven gallant fellows formed the crew, including Amundsen himself. The second in command and navigator was Lieut. Godfred Hansen, of the Danish navy, Anton Lund of Tromsø was the chief mate, Peder Ristvedt meteorologist and engineer, Helmer Hansen, with long service in the northern seas, was second mate, Gustav Wicks assistant magnetic observer, and Lundstrom was cook. In June, 1903, these splendid young Norwegians sailed with the resolution to complete the most interesting voyage there remained to be achieved on this Earth.

The interest has been accumulating during three centuries. Our Elizabethan worthies made their great discoveries in the belief that there might be a trade route from the Atlantic to the Pacific. Since their time the objects have been purely scientific. Parry in his three voyages did much, the Rosses in their discovery of Boothia and King William Land, added largely to our geographical knowledge, but it was the vast discoveries of the Franklin search expeditions which threw complete light on the geography and hydrography of the western Arctic Regions. It was ascertained that there could be no navigable North-West Passage west of King William island. Franklin had made a most successful voyage in the right direction. His catastrophe was due to the erroneous chart which made King William island a part of Boothia, thus blocking the only navigable route. It was left to McClintock to discover the only navigable North-West Passage. The ice prevented him from reaching it in the *Fox*, either by Franklin channel or Bellot strait, in spite of long-sustained efforts; but he walked over it, and established the only possible route for a passage. Moreover, he showed, from Franklin's successful voyage, that in some seasons the passage was open and navigable. In 1875 Sir Allen Young made the attempt, but found the ice extending across the channel from shore to shore. In 1903 Amundsen found the channel free of ice, and was able to reach winter quarters at the south-east end of King William island. Four attempts have been made: by Franklin in 1847, which was successful; by McClintock in 1858, when the ice was impenetrable; by Allen Young in 1875, when the ice again barred the way; and by Amundsen in 1903, when the channel was again navigable: 1903 was a Franklin year. On these four occasions the channel was closed twice and open twice. This looks as if it might be expected to be open every second year; but, of course, the data are not sufficiently numerous.

Amundsen gives an interesting account of the visit of the *Gjoa* to Beechey island, where the memorials to the Franklin Expedition, to Lieut. Bellot, and to those who died in the expedition of 1852-54 were in good order. In the voyage down Franklin channel all went well until the little vessel grounded on a bank near the southernmost of the Beaufort islands. She got off by using steam and setting all sail. Off Matty island the *Gjoa* went on shore again; and this was a much more serious disaster, as a gale was blowing. Her extrication was due to the skill and presence of mind of her gallant crew. When they reached "*Gjoa* haven," near Petersen bay on King William island, the passage was practically achieved and they had secured a well-merited success.

Amundsen gives an interesting account of his magnetic arrangements for the winter, and of his journey, in March, in the direction of Ross's magnetic pole. The journey occupied eighty-seven days, from March 1 to May 27. There is too much in the book about the Eskimos, who appear to have been a great nuisance, though useful as hunters.

Two winters were passed in *Gjoa* haven, whence an important sledge-journey was undertaken by Lieut. Hansen and Ristvedt. In the previous season of 1901,

Hansen, in a boat voyage, had laid out a depôt at Cape Crozier, being absent forty days in August and September. On April 2, 1906, Hansen and Ristvedt started with two sledges and twelve dogs, provisioned for seventy days. Hansen's journey occupied eighty-five days, the return being on June 25. He crossed from Cape Crozier, the western point of King William island, to Victoria island, discovering some islets in the channel. Thence he advanced north to Collinson's furthest, and for some distance towards Wynniatt's furthest, on the west coast of Victoria island. The account of his journey is not the least interesting part of the book.

The voyage along the coast of North America presented no great difficulties, and, after a third winter, the little *Gfoa* entered the Pacific ocean. It was a memorable expedition. Well thought out and planned, no mistakes were made, and it is wonderful that so much could have been done by such a small handful of men. They were very ably led, and Amundsen was seconded by companions with rare gifts, whose zeal and enthusiasm never flagged. He and his gallant companions have achieved a great geographical feat, the memory of which will endure for all time. The work, in two volumes well illustrated, is worthy of the subject.

C. R. M.

## MATHEMATICAL AND PHYSICAL GEOGRAPHY

### GEOGRAPHICAL EVOLUTION.

Die Entwicklung der Kontinente und ihrer Lebewelt; ein Beitrag zur vergleichende Erdgeschichte.' By Theodor Arldt. Leipzig: W. Engelmann. 1907. Pp. xix. + 730. *Figs. and Maps.* Price 20m.

This volume is to be regarded in the main as a compilation in which the author has, with great industry and research, brought together the results of the researches conducted during the past quarter of a century by a number of investigators with regard to the former distribution of land and water on the surface of the globe, and the evolution of the form of our present continents. Several of the maps with which the volume is illustrated, so far as they relate to the contour of the continents in geological times, are mainly, if not entirely, based upon those of other writers, the one of the Jurassic epoch being, for instance, a replica from that in Neumayr's 'Erdgeschichte,' with certain emendations in the shading which do not appear to be an improvement. As regards the map of the world in the early Tertiary (Eocene), we notice that this differs from the one in Dr. von Ihering's work reviewed in an earlier page, in that Patagonia is represented as connected with the Marquesas and Samoa by a large extent of land, while "Archinotis" finds no place. In the map depicting the form of the continents in the later Tertiary, a noticeable feature is the presence of a land-bridge connecting Greenland with Iceland, the British Isles, and France, as to the existence of which at such a relatively late epoch we cannot but feel sceptical.

More than half of the work is devoted to the geographical distribution of animals, in which occur long tables of species arranged under such strange headings as "Lemmidenschicht," "Viverridenaschicht," etc., the precise signification of which we confess ourselves unable to fully comprehend. This section is illustrated by several maps, which again present certain features (such as the alleged occurrence of *Cryptoproctida* in the heart of Africa) by no means easy to understand.

While the book undoubtedly contains a vast store of information with regard to the past history of the Earth and its inhabitants, we venture to think that many of the author's conclusions and opinions should be compared with those of other authorities before being definitely accepted. This is notably the case with regard to the aforesaid connection between Greenland and France, such a

land-bridge having no existence—even in the Lower Eocene or Post-Cretaceous—in the series of maps by Prof. W. D. Matthew, illustrating the hypothetical outlines of the continents of the world in Tertiary times, published in the *Bulletin* of the American Museum of Natural History for 1906 (vol. 22, pp. 353–383).

R. L.

#### GENERAL.

##### THE STEREOSCOPE IN GEOGRAPHY TEACHING.

'Geography through the Stereoscope': (a) 'Students' Field Guide,' pp. 362 and index. (b) 'Teachers' Manual,' pp. 151. By Philip Emerson and William Charles Moore. London and New York: Messrs. Underwood & Underwood.

Both these volumes show a considerable amount of ingenuity and care in their compilation, and the authors have demonstrated the use of the stereoscope as a means of teaching geography. The results of experiments in two American schools are shown in a complete scheme dealing with the world, and it must be acknowledged that the method advocated would produce more realistic knowledge and rouse, in all probability, a livelier interest in the pupils. The claims made on behalf of the method are somewhat extravagant; it has frequently been applied by good teachers to the joint use of maps and pictures—the latter carefully selected—in this country. Being American in its outlook and designedly produced to advocate the more extended use of the stereoscope, one is apt to not entirely concur with the selection of the stereographs, since some of the subjects depicted in the list would be regarded here as dealing with interesting information rather than seriously studied geography. The treatment gives a good example of a method thoroughly worked through, and in that respect the two books are likely to be most suggestive to teachers who would doubtless apply it to their needs. The authors advocate working in groups varying according to the number in the class and the number of "groups" to be dealt with. Such class-room organization is not new, as is claimed. In addition to the set "groups" of stereographs, subsidiary sets are provided to be used for reference purposes. The 'Students' Field Guide' affords a useful running commentary for each pupil on the sets of "graphs," and contains many suggestive remarks and questions designed to bring out the fundamental geographical principles which they illustrate. The cost of the outfit would, however, be considerable, and no doubt further experiment will lead to the elimination of all such subjects as are not strictly geographical in aspect. The 'Teachers' Manual' forms a running commentary as to method combined with a general geographical summary of the countries studied. There is no attempt to treat these regionally, and hence the method can only supplement real geographical classwork. If regarded as an attempt to devise some more systematic form of illustrating the geography lesson, the books must be considered ingenious, carefully prepared, and stimulating. Useful references for teachers' or students' reading are made throughout, mainly to American literature.

F. G. APTHORPE.

##### A NEW LIFE OF COLUMBUS.

'Christopher Columbus, and the New World of his Discovery.' By Filson Young.  
Two vols. 25s. net. E. Grant Richards.

In these two handsome volumes Mr. Filson Young has added one more to the many biographies of the great explorer, and has shown at least one of the qualifications for the heavy task, the possession of the pen of a ready writer. The work is avowedly an attempt "to bridge the immense gap existing between the labours of the historians and the indifference of the modern reader." Unfortunately, some

of the quarries in which the author has delved appear to yield rock of an indifferent quality. Mr. Vignaud, to whom special thanks are given in the preface, and whose views seem largely to colour the work, states, in a letter printed as an appendix, that "our belief that the discovery of America was due to an attempt to carry out a scheme for reaching the Indies by way of the west rests . . . on the word of Christopher Columbus, who was not a truthful man." Following the same writer, the Toscanelli letter is rejected as a forgery. The arguments for this are given in another appendix, and their value may be partly gauged by the statement that the information it contained about China was based "on an old and fantastic tale recounted by a Pisan traveller, Rusticiano, to Marco Polo, a Venetian, and by him published under the title of 'Il Millione,' at the end of the thirteenth century." Shade of Ser Marco Polo, was ever a more "fantastic tale" than this, to ascribe the authorship of the grave and sober narrative of those wondrous travels to a mere amanuensis!

It is probably due to too close adherence to the idea that Columbus did not seek a route to the east by way of the west, that the author makes the remarkable statement that "it is an error continually made by the biographers of Columbus that the purpose of Prince Henry's explorations down the coast of Africa was to find a sea route to the West Indies by way of the east." It is as difficult to believe that any writer could have said that the Portuguese sought the *West* Indies, as not to believe that as certainly as they sought the Indies by an eastward route round Africa, so did Columbus seek the Indies by a western route across the Atlantic. The very name "Indies" was given by Columbus to the islands he reached, the term "West" being a later addition to prevent confusion with the real Indies, for which he had naturally mistaken them.

Mr. Young hardly devotes as much space to the actual voyages as might have been expected, but this to some extent is made up for by an appendix on the course of the first voyage by the Earl of Dunraven, in which the details of the actual run are given, with an attempt to estimate the interesting effect of the magnetic variation. The volumes are illustrated by some good photographs, but the maps leave something to be desired, a reproduction of Behaim's globe being particularly unfortunate, for that famous and jealously guarded earliest globe of modern times is represented by the quadrant from China eastwards, clapped on to the quadrant from Africa westwards, with no indication of the intervening hemisphere having been omitted.

Of books about Columbus there will probably be no end. To some he will seem as to one quoted in these volumes, "boastful and lying, greedy, violent, and brutal," to others a saint inspired; but nothing will probably ever remove the fascination of the story of that humble weaver's son of Genoa, who rose to be an admiral and a viceroy, and whose high honour it was to enlarge the boundaries of human understanding by the revelation, even though it was an unconscious one, of a new and unsuspected world.

H. Y. O.

#### SHORT NOTICES.

*Europe.*—'Rock Climbing in Skye.' By Ashley P. Abraham. (London: Longmans. 1908. Pp. xxiv., 330. *Map and Illustr.* 21s. net.) The mountaineer must be a geographer in one of the most eminent senses of the word, and leaves his mark upon the map and in geographical literature, even if his object is the purely sporting one of rock-climbing. Mr. Abraham's book adds much to detailed knowledge of the Coolin, a group of mountains which he, a Cumbrian, concedes to be "the finest in the British Isles." Climbers have specialized and

extended the nomenclature of the salient features of these mountains, as of others. Many interesting points which have come under his notice (for example, the magnetism of the rocks at certain points) will be found set forth by Mr. Abraham, who writes his narrative entertainingly, his descriptions graphically. The completeness of his book as a guide may be judged from the presence of a list of the pronunciations of Gaelic topographical names phonetically rendered, a climber's glossary, a map on the scale of 8 inches to a mile, and an index. To the wide circle in which his name is famous as a photographer the beauty of the illustrations needs no commendation.

'Sunny Days in Italy.' By Elise Lathrop. (London: T. Werner Laurie. [n.d.] Pp. xi., 323. *Illustr.*) This book is a series of studies of well-known scenes and places in Italy by a writer whose power of description is considerable, and whose power of observation is such that she has fresh points to make on many familiar themes. Milan, the lakes, Genoa, the Riviera, Pisa, Florence, Siena, Rome, Naples, Venice are among those themes, but their familiarity need not deter readers from taking up the book. One is accustomed to photographs of Italian scenes without colours, but these in this book, printed on tinted paper, are so very dull of hue that they do bare justice to most of their subjects.

'The Pleasant Land of France.' By Rowland E. Prothero. (London: Murray. 1908. Pp. vii., 359. 10s. 6d. *net.*) This is a collection of essays, the collective title of which is apparently intended to convey nothing more than that they deal with French subjects. One is a study of provincial life in France; others deal with agrarian questions, the majority with literary subjects; one, however, is a fine description and historical study of the palace of Fontainebleau.

*Asia.*—'The Real India.' By J. D. Rees. (London: Methuen. 1908. Pp. xii., 352. *Portrait.*) This is a political study of the moment in India, written, not by a casual visitor, but by one who has a long and intimate experience. Two preliminary historical chapters are furnished; the present system of government, the land system, and the position of the native states are dealt with, and there is a chapter on 'Russia in the East.' The author finally elaborates a strong line of reform.

'Our First Ambassador to China. An Account of the life of George, Earl of Macartney.' By Helen H. Robbins. (London: Murray. 1908. Pp. xx., 479. *Illustr.* 16s. *net.*) This is an important contribution to the history of British relations with China, although it must be remembered that his mission thither in 1792-94 was by no means the only event in Macartney's career. Nor is this book confined to it; his mission to Russia, his secretaryship for Ireland, his governorship of Grenada, and his presidency of Madras are all dealt with, preceding his Chinese mission, and his mission to Verona, and governorship of the Cape after it. Macartney's personal narrative is simply and clearly written and full of interest. Documents hitherto unpublished have been drawn upon.

'Present-Day Conditions in China.' By Marshall Broomhall. (London: China Inland Mission. 1908. Pp. vii., 58. *Maps and Diagrams.* 1s.) This small volume contains a number of notes concerning the progress of China at the present moment, in those matters which have direct or indirect connection with missionary work. The provincial maps provided are reduced from War Office maps, but unfortunately so small as to require a glass to read them.

'The Marches of the Mantze.' By J. H. Edgar. (London: China Inland Mission, 1908. Pp. viii. and 68. *Illustrations.* 1s. 6d.) Miscellaneous notes on the interesting frontier region between China and Tibet proper, by a missionary who knows it well. Though not quite so undescribed as would appear from the preface supplied by Mr. Polhill, the region claims attention by reason of recent

events, which have in parts broken the power of Lamaism, and, temporarily at least, established Chinese influence on a firmer footing. Mr. Edgar's account of these events will be new to most of his readers. There are a few striking photographs, and some interesting details on people and places somewhat off the beaten track.

*Africa.*—‘The Passing of Morocco.’ By Frederic Moore. (London: Smith, Elder. 1908. Pp. xi, 189. *Map and Illustr.* 5s. net.) The author has been a special correspondent in Morocco during recent events. He has done similar work in the like capacity elsewhere, and those who have met with it will expect in this volume a clear account of the situation in Morocco, and much interesting narrative and description, and they will not be disappointed. The book also contains some fine photographs.

*America.*—‘The Land of the Maple Leaf.’ By B. Stewart. (London: Routledge. 1908. Pp. viii., 216. *Illustr.* 6s.) This book is an avowed attempt to show the reverse or concealed side of the picture to intending settlers in Canada. Though, as a whole, moderate in tone, it is not pleasant reading, and perhaps the author goes somewhat far in insisting upon the drawbacks, even in his descriptions of climate and scenery in Canada. Yet if the book causes those who incline to this new country to make fuller inquiry than some undoubtedly do, it will serve a valuable purpose.

‘Farm Cottage, Camp and Canoe in Maritime Canada.’ By Arthur P. Silver. (London: Routledge. 1908. Pp. xviii., 249. *Illustr.* 6s.) This volume, unlike the one previously noticed, points out Canada (at least Eastern Canada) as a paradise, but from the point of view of sportsmen mainly. To the angler and hunter it forms delightful reading, and it is beautifully illustrated. There is an interesting introduction by Lord Strathcona.

*Australasia.*—‘Australia’ (‘Romance of Empire’ Series). By W. H. Lang. (London: Jack. [n.d.] Pp. xi, 300. *Maps and Illustr.*) The idea of this series is clever, and Mr. Lang, in the present volume, has not lost sight of it. In the attempt to keep his narrative popular, he lapses into occasional colloquialism—one does not feel, for example, that the phrase “poor old De Quiros” is either romantic or wholly deserved by the explorer. But most of the story is free of such blemish, and throughout, whether exploration, or mining, or bushranging, is dealt with, the interest is maintained. Some of the coloured illustrations, from original drawings, are fairly effective.

*Polar Regions.*—‘The Log of the *Laura* in Polar Seas.’ By Bettie Fleischmann Holmes. (Cambridge: University Press. 1907. Pp. 137. *Map and Illustr.*) This is a volume *de luxe*, dealing with the cruise of an American party from Tromsø to Spitsbergen, the seas east of Greenland, and Jan Mayen, in 1906. The narrative is in diary form, its abbreviations and terseness unaltered; perhaps it is the more vivid in consequence. But the book would be worth inspection only for the sake of the beautiful reproductions of photographs, which could hardly be surpassed in their way. Some meteorological records are provided in an appendix.

*General.*—‘Mines and Minerals of the British Empire.’ By Ralph S. G. Stokes. (London: Arnold. 1908. Pp. xx. and 403. *Illustr.* 15s. net.) Here is a full and, so far as it is possible to judge, an admirable work of reference on its subject. At any rate, so far as concerns the superficial requirements of such a book, all are present—careful classification, clear and straightforward diction, a judicious use of statistics, either generalized or given in comparative form, a good index, and so forth. And the wide experience of the author should guarantee accuracy, as nearly as possible. It may be mentioned that the dominions “beyond the seas” are dealt with; the United Kingdom is not included.

## THE SOUTHERN CYCLONIC BELT.\*

By Colonel H. E. RAWSON, C.B., R.E.

1. The long-recognized "Belt of Calms" in southern latitudes is none other than the oceanic portion of the great southern anti-cyclonic belt, whose action-centres both on land and sea are characterized by calms.

2. The migration of the belt of calms north and south "with the sun" has been found to be accompanied by just such variations of atmospheric pressure as would result from a migration of the anti-cyclonic belt. The weather experienced in South Africa is the direct result of such a migration, and anomalies become intelligible at once; *e.g.* the Cape winter is wet, whereas that of Natal and the Transvaal, and practically the whole of Orange River Colony, is dry. The Cape summer is dry, while that of the others named is wet. The primary cause is the control exerted by the dry anti-cyclonic belt over the areas it traverses.

3. If the range of the migration were the same each year the weather of South Africa would be easily predicted, for the meteorological conditions are wonderfully stable. The broad variations in the seasons are just what should take place if there was a small constant displacement of the belt each year, which was cyclical in character and had a period approaching nine years.

4. The displacement of the belt has been traced by analyzing (a) barometrical records made at the Cape Royal Observatory since 1841, and Durban Government Observatory since 1873; (b) reliable records published by various early observers, and by recently established Government departments; (c) personal inquiries into records kept by hundreds of workers from the Cape to the Zambesi, and from Durban to Beira; (d) travellers' records going back as far as 1622; (e) isobaric charts of the oceans, and of the land areas, of the southern hemisphere published by our own Admiralty, and by numerous scientists, both English and foreign (Buchan, Clement Ley, Hildebrandtsohn, Mohn, and others).

5. The belt is found to have a progressive displacement from its farthest south to its farthest north position, and to perform the journey in 9.5 years. It returns in the same period, completing the double journey in nineteen years.

6. It was farthest south in 1884, and farthest north in 1893.

7. All the droughts and excessive rainfalls experienced in South Africa within the last sixty years, support the theory of a cyclical displacement of the belt, and corroborate this periodic oscillation (figures are given in the paper). Proofs of it are also found in the records of the New South Wales Observatory, and in the published researches into Australian meteorology, carried out by Mr. Russell, F.R.S., the Government astronomer.

8. Strong proof is afforded by comparing isobaric charts of the southern hemisphere, which are found to differ according to the periods they deal with (see details in the paper).

9. It was detected that in the year 1893 icebergs were met with much further north than usual, and it was inferred that the rain belt to the south of the anti-cyclonic belt had a similar progressive and cyclical oscillation. Further investigations have confirmed this, and the matter is being pursued. Since 1884 the latitudes in which ice has been reported by shipping have varied in direct relation with the position of the anti-cyclonic belt.

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\* Notes by the author on the theory advanced in a recent paper read before the Royal Meteorological Society, that there is a cyclical displacement of the southern anti-cyclonic belt.

10. Such a displacement of the anti-cyclonic belt could not but effect the seasonal movements of the equatorial rain belt, which the Surveyor-General of the Egyptian Government has recently brought before the Society in a paper upon the floods of the Nile basin. The correlation has proved to be precise. When the anti-cyclonic belt is north of its mean cyclical position excessive floods have been experienced; while there has been a deficiency of rainfall in the Nile basin when the belt was south of this position.

11. If an analogy for such a displacement of the belt is looked for, it can be found in the shifting in latitude of the belts of Jupiter. They have been proved to approach towards, and recede from, the equator of that planet in a very similar way to that which the present theory suggests for our anti-cyclonic belt.

## THE MONTHLY RECORD.

### EUROPE.

**The Bézin Glacier.**—An article by Paul Girardin on the Bézin glacier in Maurienne appears in the *Bulletin de la Société Neuchâteloise de Géographie* (vol. 18, 1907). The monograph, which is intended as a contribution to the study of glacial erosion, is part of a scheme to compile an atlas of French glaciers, and also part of a larger scheme for the special study of various land forms—forests, dunes, volcanoes, etc. Not only will the contour of the glacier be studied, but also its morphology and environment. The Bézin glacier consists of upper and lower glaciers. These lie in hanging valleys or cirques which communicate by means of torrents. Such a ladder of cirques characterizes the morphology of the region. Formerly a large glacier covered the plateau at a height of 3000 metres. It has been split up, and the higher and lower Bézin glaciers are two of the parts. They are noteworthy chiefly on account of their sources of supply, their moraines, and the lakes which mark phases of their retreat. Glacial basins differ from water-catchment areas in that the snow may be blown away from the former by the wind, while the rain which falls within the slopes of a river-basin by one way or another reaches the river. Snowy days in this region are generally windy, and the snow is banked up into dunes. The glacier is of the Swiss type—a narrow tongue of ice. Two lateral moraines meet in front—the one 450 metres, the other 300 metres long—separating two small lakes from each other. The increase of length in the lakes shows the shrinkage of the glacier. Two torrents feed the lakes at the foot of the glacier, and the hydraulic energy available could be utilized if the water were artificially collected into one fall. A volume of 250 litres a second could thus be obtained during eighty days in the year. The two V-shaped valleys in which the upper and lower glaciers lie owe their shape to the streams which excavate their depths and carry away lateral *débris*. Below the glaciers the valley has become U-shaped, owing to the undisturbed *débris* which has rolled down.

**The Niolo River, Corsica.**—To the February number of *La Géographie* for 1908, M. Paul Castelnau contributes a physiographical study of the Niolo, a river of Corsica. It flows into the Golo, which is the largest and most important river of the island, with three geological and tectonic divisions. The upper basin is that of the Niolo. It forms a granitic zone, which is separated downstream from the sedimentary formations of the east and north-east by a granitoid ridge. This is pierced by a narrow gorge. At Francardo—lower still—the central depression of Corsica is reached. The river flows through this lowland at right angles to the

coast, and at Ponte Leccia is captured by a primary river flowing to the Tyrrhenian sea. Where the granite ridge—7 or 8 kilometres wide—is passed, a sill checks backward erosion. A V-shaped ravine—studded with pot-holes—forms the talweg, but the denuding agencies are insufficient to form subsequent streams on either side. Thus the sill forms an obstacle which checks the riverine forces of denudation from lowering the bed of the Golo beyond. The basin of the Niolo is unique in Corsica, lying as it does amid the mountains at a height of 850 to 950 metres. It was the last stronghold of ancient customs, and from it still takes place the double emigration: to the pastures in summer and to the plains in winter. The rocks on the mountain slopes are split up by variations of temperature. Where softer granites occur, cavities—called “tafoni”—are hollowed out. They occur thickly along the escarpments, where the *débris* is removed by the wind. Many detached granite blocks, thus denuded, appear like huge sponges. These forms are found in Madagascar, and were seen by the crew of the *Discovery* in the regions of the south pole. The valley of the Niolo, with its volcanic soil and moisture, is of great agricultural value, but such development is discredited. The forests are daily destroyed by the flocks and fires. Soil is carried down from the slopes, choking the rivers and forming malarial swamps.

**Settlement of the Alps and Karst Lands.**—As a further contribution to the study of the relationships between man and nature, discussed by Prof. Schlüter last year in the *Geographische Zeitschrift*, Otto Jauker adduces ‘Observations on the History of the Settlement of the Alps and Karstlands,’ in No. 4 of the same journal for the present year. However high may be rated the initiative of man (on which much stress had been laid by Prof. Schlüter), there are yet, Herr Jauker points out, permanent geographical conditions not to be surmounted, and to which man has to adjust himself. Widely as the character of settlement, culture, commerce, and means of communication may differ in the same habitat in prehistoric, Roman, mediæval, and modern times, there are still discernible geographical factors, now less, now more under human control, but not to be overridden, and prescribing certain “historic leading lines” to the communications and other relations of the region. In the Karst, the fruitful “poljen” lands first induced the formation and growth of populous settlements, and these to-day are as dependent as ever on the geological subsoil. In the Alps, again, the slopes and terraces have been, and continue to be, the characteristic sites of settlements. In Central Europe the first settlers selected unforested sites in the steppe lands as relatively fruitful, and the range of certain species of plants coincides strikingly with the range of settlement. Till late in the Middle Ages the tracklessness of the woods and the difficulty of extirpation induced people to cluster together in great density in the steppes. Illustrating the difference between regions on which the Romans stamped their policy and regions they left untouched, or where their mark was impressed later, the writer points out how before the Roman invasion the Alpine lands were well populated, and how the pre-Roman inhabitants spread into the remotest valleys, occupying high-lying meadows, unforested patches on rocks, and the more or less steep southern slopes, and carrying on a busy mining industry. The Romans, in the course of their conquests, utilized the roads and mines they found. Only later on did they, according to requirement, lay down new lines which yet ran through populous oases and marked the distribution of the cultivable lands. The Romans often preferred carrying their roads along the slopes of valleys and over terraces, where the larger part of the older settlements lay. Herr Jauker notes the changes wrought on the Karst and Alpine lands by the “Völkerwanderung” and the Middle and later ages, and shows how, through all these transformation scenes, the geographical factor was by no means neutralized, but prescribed to each region

a topographic continuity of settlement: such and such places for habitation; such and such lines to be utilized for intercommunication; such and such points as centres of culture.

**Timber Transport in Sweden.**—Prof. Gunnar Andersson has contributed to *Ymer*, Häft 4, 1907, a long article on the floatage of timber down the Swedish rivers. There is no forest area of Upper Sweden, he says, which cannot be exploited owing to lack of water-transport. On the rivers of Norrland, Dalarna, and Värmland there are about 15,700 miles of waterways available for floating timber, and of the great rivers, the Torne, Lula, Ångerman, and Ljusnan a large proportion of the main streams—in the case of the last as much as 90 per cent.—that flows through forests can be utilized. Another geographical condition of great importance to the lumber industry is that the rivers are so numerous and do not unite into a few large estuaries before reaching the sea. From the Torne to the Dal inclusive, floatage-waters terminate directly in the Gulf of Bothnia, or close to it, at 61 points. Of these there are eleven large rivers, each over 180 miles in length; nine between 60 and 120 miles; seventeen between 30 and 60 miles; besides twenty-four small streams. The fall of the rivers varies from about 11 feet per mile in the Ljungan and Pite down to about 4·8 feet in the Torne and Klar. In this respect Sweden is particularly fortunate, the current being just sufficient for free floatage, that is, each trunk by itself, and not swift enough to interfere with the transport of timber. The fall is eight to ten times as great as in the Dvina and Pechora, where accordingly free floatage is impossible, and the transport of a given quantity of timber demands far more labour, and consequently is much more expensive. The observations of the velocity of the current, which, of course, does not depend on the fall alone, have almost all been made at the time of low water. Measurements made by the engineer, Smedberg, in the Gallsångs river show that the mean velocity is generally from about 1 to 8 feet per second. From all the data at his disposal Prof. Andersson estimates that the average surface-velocity during the floating season in the large rivers may be in favourable circumstances about 53 miles in twenty-four hours. The records of rainfall are very defective; at a rough guess perhaps the fall in the mountain and forest region is from 27 to 31 inches in the year. Important questions, which cannot yet be answered satisfactorily, are, what proportions of the drainage are derived from surface water and spring water respectively, how much water is evaporated, and how much finds its way into the rivers. As the ground is frozen a great part of the year probably little of the water melted from snow and ice sinks into the soil, but most is carried off in the spring flood, which, in the northern districts, is very high compared to the rainfall. But the timber from the more remote forests could hardly cover the distance to the coast during the summer were it not for the "mountain flood," caused by the thaw in the mountain region, which comes down in June, or about a month later than the ordinary spring high water, hastens the passage of the timber and facilitates the movement of stranded logs. When the spring and mountain floods come near together, or occasionally coincide, owing to a warm spring, the year is unfavourable for floatage. Lakes, which are numerous, are useful in regulating the head of water, but necessitate the warping or towing of the logs to the outlet, entailing additional expense and loss of time. Prof. Andersson gives also numerous details and figures relating to the lumbering industry and the works that have been carried out in connection with it—dams, timber runs down rapids, etc., and, lastly, refers to the conflicting interests of lumberers and users of water-power.

#### ASIA.

**Recent Events on the Western Chinese Frontier.**—The *Bulletin du Comité de l'Asie Française* publishes an account by M. Jacques Bacot on his explorations,

in 1907, along the Chino-Tibetan frontier. Previously to his arrival the region had been the scene of a widespread revolt of the Tibetan lamas against the Chinese authorities, and M. Bacot has brought home trustworthy news of these events, and of the terrible reprisals and massacres that ensued.\* He derived his information partly from two missionaries who escaped, partly from some of the mandarins who were there at the time, and partly from the soldiers of his own escort, who were eyewitnesses of much that happened. The region comprises so much of the valleys of the upper Yangtse, Mekong, and Salwin, as lies between the latitude of Batang to the north and that of Likiang to the south. The immediate vicinity of Likiang is Chinese, but all the other tracts are Tibetan, while the Mossos, a tribe scattered along the eastern margin of the Mekong, south of Yerkalo, are intermingled with the Tibetans, and are under the jurisdiction of their own chiefs, the principal of which resides at Yetche. The supreme authority rests, however, with the Chinese mandarin at Wesi. Further west are the Lissus, Lutses, and Kiutses. The narrative of events that led up to the revolt of the lamas at Batang and other neighbouring monasteries, and its eventual suppression by the Chinese, is given with much detail by M. Bacot. The lamas appear to have shown great ferocity, not only against their Chinese masters, but also against the French missionaries, four of whom they cruelly murdered, viz. Pères Musso, Soulié, Dubernard, and Bourdonnec. Father Dubernard had resided at Tseku (see below) over thirty years, and had often been spoken of with gratitude by explorers who had enjoyed his hospitality. Eventually the revolt was quelled by a General Eul Fong, who resorted to the most ferocious and barbarous methods of repression by fire and sword, and who is now said to be endeavouring to restore, at considerable expense, some semblance of civilization in the regions he has been at such pains to devastate. M. Bacot is of opinion that the Chinese policy of destroying the lama authority in Eastern Tibet, while they are confessedly dependent on the good-will of the lamas of Lhasa and its neighbourhood, is one fraught with great danger.

**M. Bacot's Journey in South-Eastern Tibet.**—Another paper by M. Bacot (*La Géographie*, May, 1908) describes a pilgrimage he made in the Tsarong country round Dokerla, a peak in the range separating the Mekong from the Salwin, a little south-west of Atentze. M. Bacot had originally arrived by way of Tongking and Yunnan at Tseku, a place mentioned many years ago by the Abbé Desgodins, and since visited by Prince Henry of Orleans and Lieut. Grillières. Formerly the hostility of the lamas prevented any exploration in this direction, but the terrible repressive measures instituted by the Chinese after the murder of their ambassador, as mentioned above, have thoroughly alarmed the Tibetans and brought about a complete change in their demeanour. The chief objections to the trip were raised by the Chinese prefect of Likiang, who sent an official after M. Bacot after the latter had proceeded northwards to Yerkalo and Batang, to bring him back to regions where closer supervision could be kept on his movements. M. Bacot succeeded in giving this official the slip at a place called Mapatin, where the Mekong was crossed by a rope-bridge, and thence proceeded to Merechu, where a torrent marks the boundary between the jurisdiction of China and Lhasa. The crossing of the dividing range was attended with troubles, both M. Bacot's cook and his saddle-horse succumbing to the cold and exhaustion. The Ukio, a tributary of the Salwin which was here crossed, makes an extraordinary double loop, and after a course of several miles returns to a spot near Wabo, less than a

\* Some account of recent events on this frontier is also given in Mr. J. H. Edgar's recent book, 'The Marches of the Mantse' (*supra*, p. 176).

hundred yards from the other bend of the loop. The inhabitants of Wabo were rather hostile, but the place itself consists of three pleasant villages, the houses being large and well cared for. From Chana to Lakura the main stream of the Salwin was followed, and then the pilgrim track led for three days to the south-east up a stream coming from Dokerla and along gorges and past abysses of the most dangerous description. Pilgrims are often roped together like Alpine travellers, but if one should chance to slip, the others often allow themselves to be dragged down the precipice, thus ensuring for themselves a pious death and glorious reincarnation. M. Bacot made the circuit of the sacred mountain, rejoining the Mekong near Langtae, but he does not appear to have actually seen the peak of Dokerla, except from one distant point of view, where it had the aspect and shape of a trident. His observations on the different zones of vegetation passed in the course of his journey are interesting. He was also enabled to record the different stages of the route from Atentze to Lhasa, a list of which he gives, with the itineraries of Huc and Desgodins annexed for comparison. Some alarming tales were told him about the Poyul country, which is said to be inhabited by a race of Chinese soldiers, who settled there at the time of the conquest of Tibet by China. They carry swords of formidable length, and are armed with iron cuisses or greaves. Nevertheless, merchants from Likiang repair thither to buy musk, the chief product of the country.

**Journeys in Western Sechuan.**—Further accounts of Captain D'Ollone's journey (*Journal*, vol. 29, p. 225; vol. 30, p. 437) have appeared in recent numbers of *La Géographie*. In the course of his journey through the country of the Independent Lolo, the traveller made inquiries regarding the origin of these people, and arrived at the definite conclusion that Taliang-shan, between the Yalong and the loop of the Yangtse, is not their original seat, but that they have occupied it less than two centuries. He was told that they came from Weining in Kweichow, and in order to test this statement explored the mountainous region in that direction, going south from Kiangnan on the Yangtse to Yunnan-sen. The rumour proved correct, for he recognized the form of the Lolo villages, their fortified caverns, and their tombs. He was also enabled to collect some Lolo books, and satisfied himself that Lolo histories exist, but so far has not been able to translate them. As to the writing of the Miaotse, who are also found, although in fewer numbers, in this region, Captain D'Ollone was able to obtain a key to their characters. He showed these to a Chinese professor of the University of Yunnan-sen, who pronounced them to be a cursive form of very ancient Chinese characters, dating from 300 B.C., and the discovery suggests some important ethnological and historical questions. The Captain's itinerary, on leaving the Yangtse, coincides for a short distance with that followed two months previously by the Bons d'Anty mission. To the south he was enabled to shed light on the hydrography of the mountainous region round about Weining, Chenhsiong, and Yongning, which drains into the Yangtse. Many of the streams are lost below the ground, and reappear further on under other names. At Weining Captain D'Ollone regained the principal route from Chungking to Yunnan-sen, and noted several inaccuracies in the maps of previous travellers. The itineraries of M. de Vaulserre he pronounced very accurate. From Yunnan-sen, Captain D'Ollone has since gone north once more *viâ* Ningyuan-fu to Ta-chien-lu, eventually reaching Chengtu, whence he hopes to continue [his journey northwards. Another piece of exploration in Western Sechuan, by Surgeon-Major Legendre, is described in the May number of *La Géographie*. The route followed was southward from Chengtu to Ningyuan-fu, the principal town in the Kienchang valley. On his return the doctor diverged to the west somewhat, following the course of the Yalong for part of the way. Part of the outward route

coincides with that followed by Dr. R. Logan Jack, on his journey through Western China to Burma. M. Legendre furnishes a few notes on the Lolo inhabitants of the surrounding country, and endorses a suggestion made by some other French travellers, that the railway, now in course of construction, from Tongking to Yunnan, might most advantageously be prolonged to Sechuan and the upper Yangtse, *viâ* the Kienchang valley, and thence across two mountain chains, each about 9000 to 10,000 feet in height, and on to Chengtu-fu.

**The Bons d'Anty Mission in South Central China.**—News of this mission is contained in the March number of the *Bulletin du Comité de l'Asie Française*, where a circumstantial account is given by M. Bons d'Anty (who, we may recall, is French Consul-General at Chengtu-fu) of his cruise by water from Changsha, the capital of Hunan, down the Siang river, and in a north-westerly direction by the Paikow or "fan" canal, to Changte (described by Mr. Margary some thirty years ago). The narrative gives a good description of what travelling by water in Southern China is like in the month of February. The sketch-map and the topographical notes show that even the best maps of this region require considerable modifications.

#### AFRICA.

**The Kamerun Mountain.**—One of the expeditions organized by the newly formed Commission for the Geographical Investigation of the German Protectorates (cf. *Journal*, vol. 28, p. 672) is that of Prof. Kurt Hassert and Prof. Thorbeck to the Kamerun, which set out about the end of September of last year. Explorations on and around the Kamerun mountain were among the first items in the programme, and some notes on the work carried out before the end of the year in this direction have already appeared in the *Mitteilungen aus den Deutschen Schutzgebieten* (1908, Part I.), in the form of extracts from Prof. Hassert's letters. Although many ascents of the mountain have now been made, they have usually been effected by one or other of the two most frequented routes, so that a wide field for research still remained open in the examination of the less-known sides of the range. The great obstacle in the way of its scientific exploration is the extreme scarcity of water in the upper parts, for though situated in the most humid region of Africa, there seems to be only one permanent source of supply above the inhabited region, and this becomes very scanty in the dry season. Even the highest native settlements are very badly provided, and water has often to be fetched from long distances. The reason is the great porosity of the lavas, which quickly absorb any rain that falls. In spite of these difficulties the travellers not only made two ascents to the highest point but traversed the upper plateau in various directions, besides making a complete circuit of the outer slopes. In the upper region, temperatures of 4° C. (37°·4 Fahr.) and under were frequently encountered, and the strong winds and prevalent mist seem to have made the conditions far from pleasant. A marked inversion of temperature was noticed at the highest levels, where the air was decidedly warmer than somewhat lower. Prof. Hassert suggests that this is due to the smaller degree of cloudiness at the actual summit. The sun's heat is absorbed by the black volcanic ash, and by plunging the hands into this a distinct warmth was perceptible. It is suggested that the warmth of the soil observed by several travellers may be explainable in this way rather than as a result of lingering volcanic activity. In connection with the climatic conditions, Prof. Hassert notes that on one side of the mountain many of the trees at the upper limit of their growth were either dead or dying, while on the opposite, more humid, side this is not the case. He thinks that this may be an indication that the climate is becoming drier. The travellers were struck by

the sudden passage from forest to grass land at the upper limit of the former, there being no zone of stunted tree growth, though trees, singly or in clumps, are found within the grass area. The lava-fields, the traversing of which involved much fatigue, were generally devoid of all vegetation except mosses and lichens, though where these had been long established they had in places prepared the ground for other plants. An interesting result of the exploration is the evidence of the very recent presence of volcanic activity, especially on the north-east side. Besides the crater discovered by Herr Meyer (*Journal*, vol. 22, p. 571), whence sulphurous vapour was distinctly seen to emerge, the travellers passed, on this side of the main range, through a whole region of secondary cones and craters, bearing evident traces of recent formation, while they found that reports of eruptions having taken place within the last century were current among the natives. They met with a friendly reception among the Bambuko of the little frequented north-west side of the range, and the pleasant manners of these people is attributed to their having remained so far at a distance from European influence.

**The Inscription near the Mouth of the Congo.**—Since the publication of Mr. Lewis's paper in the June number, it has come to our knowledge that a photograph of the Diogo Cão inscription there reproduced and described (p. 590 of that number) was the subject of a note in the Portuguese paper *Mala da Europa* (Ano 11, No. 26). A reprint of this note, which is accompanied by reproductions of photographs of the inscription,\* has been obligingly sent us by the secretary of the Lisbon Geographical Society. The rendering of the text of the inscription there given agrees in the main with that supplied on p. 590 of our June number, while plausible explanations are given of the one or two doubtful points. The puzzling word at the end of the second line of the main inscription, which it was natural to suppose might represent some honorific epithet of the king, is read as 'Esclariçydo' ('esclarecido' in modern spelling). This is not an epithet commonly applied to the king by the old historians, but there can be little doubt as to the correctness of the proposed reading. The words following the cross in the upper part of the right-hand rock are read as "da doença"—the cross being held to signify the death of the individual whose name appears below. The whole thus reads, "Died of disease, João Alves." Similarly, the symbol just above the two lowest names is taken to signify the deaths of these two individuals. The first of these names is somewhat strangely read (though with a ?) as Ribero, instead of Pinheiro, as suggested in our June number. The only difficulty in accepting the above interpretation lies in the fact that two of the names in question are among those which it seemed legitimate to identify with those of pilots and others whose subsequent career is, in part at least, known. It is hardly likely that there should have been two pairs of duplicate names among the navigators of the time, and the question arises whether the whole inscription really refers to Cão's voyage, or whether some of the names may have been added in the course of subsequent voyages. It will be noticed that the form of the letters (especially *a*) is not the same in all the names.

**Coast-bars in West Africa.**—The bars due to the action of the surf are a well-known feature on the west coast of Africa, but the precise conditions to which they owe their formation have not yet been accurately studied. An attempt in this direction has lately been made by M. H. Hubert, who, during a scientific mission to Dahome, took a number of measurements of the under-water contours

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\* Some of these are erroneously ascribed to Mr. Lewis himself. The reproductions give indications that the inscription was touched up somewhat, either on the rock or in the negative.

of the shore beneath the wharf at Kotonu, besides making a general study of the action of the waves as they approach the land. He has given his general conclusions in the *Annales de Géographie* for March last. In general the submarine contours-lines run with great regularity parallel to the coast of Dahome, the steep drop to the ocean depths occurring at about 15 to 18 miles from the shore-line, while within this distance the slope is gradual and uniform. In the immediate neighbourhood of the shore the slope may be divided into three separate portions, the first being characterized by a steep fall (1 in 10 for the first 30 or 40 feet); the second forming a nearly level platform, about 230 feet wide, at the outer edge of which the "bar" occurs; whilst the third falls regularly at an angle of about 4 or 5 in 100. The effect of the oceanic swell is to carry the sand and shingle coastwards till it reaches the contour-line of about 6 feet, when it is deposited to form the submarine ridge at the edge of the coast platform. The material which forms this ridge is, however, constantly transported shorewards from its inner side, so that both shore-line and bar gradually move out seawards. M. Hubert endeavours to define the reciprocal action of the shore-contours on the waves and of the waves on the shore-contours, dividing the field of action into a series of zones, according to the character of the waves. The oceanic swell is converted into breaking waves as it approaches the bar, while a second series of breakers is found when the undulatory movement approaches the shore-line proper, in the neighbourhood of which the "reversed wave" plays an important part. The general conclusion drawn is that the phenomena described do not differ fundamentally from those to be observed on European coasts in stormy weather, as e.g. on the coast of the Landes, which presents many analogies with that of Dahome. They are, however, accentuated, in the latter case, by the strength and regularity of the swell.

**Minerals in the Nyasaland Protectorate.**—The mineral survey of Nyasaland is being carried out by two surveyors under the supervision of the director of the Imperial Institute. The results of the first year's survey (1906-07) are given as a Colonial Report (Miscellaneous, No. 48). In that year twelve interim reports were forwarded to the Imperial Institute, together with a hundred and eighty-nine specimens of minerals. Among the economic minerals found are many limestone deposits suitable for making lime available for the manufacture of mortar for plastering. In the vicinity of Chenkumbi hill there is a band, 1500 feet thick, of crystalline limestone, traceable for 30 miles to the north-west. In the district west of the Lisungwe river three outcrops of limestone were examined, two of them similar to the limestone of Chenkumbi, of which, it is conjectured, they are a south-west extension. Many outcrops were also examined among the Port Herald hills and other localities. Iron ores, principally mixtures of hæmatite and magnetite, have been found. Promising deposits crop out on the Mvai and Dzonze ridges. A sample from Mangui hill proved to be a rich hæmatite ore, though containing a rather high proportion of phosphorus; and 53,000 tons are stated to be in sight. A sample of magnetite from the Pokonyowa valley contains 71 per cent. of iron, and is free from phosphorus and sulphur. Of two samples of coal from the Sumbu district, one was from a seam not more than 1·5 inch thick, the other from a bed of shale 20 to 40 feet deep. Both were of poor quality, but at lower levels thicker seams may be met with. In any case the minerals found give a clue to the geological character of the country, as well as to the mineral resources of the Protectorate.

#### AMERICA.

**The Coast of British Columbia.**—The 'Summary Report of the Geological Survey of Canada for 1907' includes some notes by J. Austen Bancroft on the

coast of British Columbia from Powell river to Kincome inlet, including the adjacent islands. While the distance between these two places is 112 miles, the coast-line examined extended over 1540 miles, of which the mainland comprised 680. The region is a fine example of a deeply dissected, submerged land area. Vancouver island was once connected with the continent. In the intermediate low-land area are one or two river systems which receive tributaries chiefly from the east. During Triassic times intense subaqueous volcanic action took place, giving rise to many varieties of volcanic rock. The latter pushed through the stratified rocks of Upper Jurassic times, and formed the coast range batholith. The stratified rocks formed the roof of the batholith until they were eroded and removed. Within the region examined are about fifty uneroded patches, and in these prospectors should look for minerals of economic value. Small faults formed in these volcanic rocks, which once were floating on the plastic magma before it cooled down. Along these, heated waters and vapours deposited copper minerals. From Open bay in S. Valdez island to Granite bay on the west side extends a limestone belt, with a maximum width of over a mile. Numerous claims have been made within this area, which deserves careful prospecting. On the Rodonda island lies a deposit of magnetite, in one place 54 feet deep and 35 feet wide. The ore is high grade, and shipping facilities could be easily arranged, although the ascent from the water is steep. At Squirrel cove, Walsh cove, towards the head of Pendrell sound, and at Kwatsi bay, granite is found, and can be immediately shipped. The orbicular diorite would furnish a unique ornamental stone. The finer grained glacial clays on S. Valdez island and Reade island afford excellent material for the manufacture of bricks. Detailed reports on a hematite deposit are to be rendered shortly.

**Surveys in Alaska.**—Since the discovery of gold at Nome in 1900, Seward peninsula, in the north-west of Alaska, has been in rapid development. From a camp of tents Nome has now grown into a modern town, with a population of 3000 to 4000 in winter, and from 6000 to 7000 in summer. Under the stimulus of the discovery of precious metals, other towns have been springing up in the peninsula, such as Solomon, Council (75 miles north-east of Nome), Candle, Teller, and York. From Nome a railway runs 75 miles north; from Solomon another 30 miles north; from Council another 6 miles north-west. At present, communication with the outside world is maintained, from June to the end of October, by boat from Seattle and St. Michael's, and for the rest of the year by sled over a circuitous route 842 miles long, following river-beds and the stormy shores of Norton sound. To find a better and permanent route by which all parts of the interior of Alaska might be reached, a reconnaissance and preliminary survey was carried out (July–September, 1906) from Fairbanks *via* Glen to Yukon river at Rampart rapids, thence to the mouth of the Koyukuk, and by the head of Norton bay to Council city. The official report of the engineer of the expedition, Mr. J. L. McPherson, dated December 18, 1906, has now been printed, accompanied by numerous maps and illustrations (59th Congress, 2nd Session, Document No. 214). By this expedition some welcome additions have been made to our knowledge of Alaska. Thus, of the tract between the Koyukuk and Koyuk rivers (199 miles long by the projected route), we have hitherto known little more than that it was a "mountainous region." Thanks to the expedition, we now possess a fairly detailed account of the country between these two rivers for a distance of from 2 to 5 miles on each side of the projected line. It is stated that, "of the 552 miles of survey, 355 were transit lines with angular deflection from the true meridian as determined by solar observation, and 197 needle lines;" and that twenty-one latitude and azimuth observations were taken. Though the

study of future railway extension along the line of route was not included in his Commission, Mr. McPherson, sensible that such a project cannot be long delayed, estimates that a railway line from Fairbanks to the head of the Yukuk river would measure 620 miles, and, except at the crossing of the Yukon and Kokuyuk rivers, would involve no engineering difficulties. The Report includes a continuous description of the route from Fairbanks to Council city.

**The Magnetic Survey of the United States.**—An interesting *résumé* of the results, to date, of this survey, was presented to the National Academy of Sciences at Washington on April 22 last, by the late Director of the Survey, Dr. L. A. Bauer. The statement, which is printed in *Science* for May 22, shows that the three magnetic elements have now been determined at about 3500 points, two-thirds of which were occupied during the years (1899–1906) in which Dr. Bauer had charge of the survey, their average distance apart being from 30 to 40 miles. The recent work of the survey has been marked by the special attention paid to the elimination of instrumental errors, as well as to that of station errors by means of the multiplication of stations, a result being that the accuracy of the work has distinctly advanced. Since 1903, observations at sea by coast-survey vessels have also been inaugurated. Among the points brought out by the survey is the demonstration of the great irregularities of the lines of equal values, which become more devious the more the observations are multiplied. The ocean magnetic work of the Carnegie Institution has shown that practically every land mass exhibits irregularities in magnetic distribution greater than would appear were the same region covered with deep water. Dr. Bauer discussed the question whether any general magnetic formula can be established on the lines of that of Gauss, and pronounced it extremely doubtful whether any good purpose can be served by the attempt to do so, at any rate for land areas. A study of the magnetic field of the United States shows that we have to do with irregularities of various gradation, covering areas of varied extent—a locality, county, state, or an entire continent. But not only is it clear that a formula based on the entire Earth cannot include also disturbances of local or regional character, it appears also that existing formulæ do not even adequately represent the continental effects. The time appears, therefore, to have come to a halt in the establishment of a complex formula, involving some forty-eight unknowns, which can at the best give but an inadequate representation of the actual facts. Dr. Bauer pointed out that the United States constitute at present the largest land area for which a detailed and accurate magnetic survey has been made. A further valuable addition to our knowledge of the Earth's magnetism will, however, be made by the Indian survey now in course of execution, of the progress of which some account is given in the latest 'Narrative Reports' of the Survey of India. In this case the density of the stations is about one to every 1200 square miles, giving a distance apart of 35 to 40 miles.

#### AUSTRALASIA AND PACIFIC ISLANDS.

**State Aid for Geography in South Australia.**—We have received a copy of the *Adelaide Register*, containing an account of the annual meeting, held on May 21, of the South Australian branch of the Royal Geographical Society of Australasia. In the course of his address, the president, Mr. W. B. Wilkinson, referred to the society's new rooms in the Institute Building, Adelaide. A new wing has been added to the institute, providing excellent accommodation for the local Royal and Royal Geographical Societies and the South Australian Society of Arts. The cost of the extension, amounting to over £6000, was borne by the South Australian Government out of the ordinary revenues of the State. Mr. Wilkinson reported that the York Gate Library, which had been purchased by the

society at a cost of £2000, had arrived in Adelaide during the year; but owing to delay in providing the necessary shelf accommodation the volumes still remained in their packing-cases. He was able to announce, however, that thanks to the generosity of the Government, the necessary accommodation would now be provided at the expense of the State, and it was hoped that the library would be formally opened in the space of two or three months. The meeting was held on the eve of the ninetieth birthday of the secretary to the society, Mr. T. S. Reed, and during the proceedings the Governor of South Australia, Sir George Le Hunte, presented to Mr. Reed a testimonial in commemoration of the occasion, and in recognition of his long and valuable services to the Society.

**Geological Survey of New Zealand.**—The first annual report of this department gives a useful sketch of the recent progress of geological research in New Zealand. The work of Darwin, Dana, and Hochstetter first threw light on the geology of the islands. In 1867 Sir J. Hector was made Director of the Geological Survey, and by 1903 the features of the country were broadly mapped out, in spite of the difficulties of exploration and the lack of roads. In 1904, under the directorship of Mr. J. M. Bell, the survey was reorganized. The country was divided up, each division representing some problem of geographical interest, e.g. the Hauraki division with its quartz fields. Each division was split up into survey districts. Special stress was laid on economic potentialities of geological formations; mineral deposits of commercial value were investigated; guidance was afforded to prospectors. The mining and water-power resources of the mountain districts were seen to be important. In 1905 detailed field work was begun in the North Westland Division, in Hauraki, and Central Otago, and public interest was aroused in the whereabouts of mineral deposits. A library of over 1600 volumes was also collected. At the International Exhibition at Christchurch there was a geological exhibit of the Hokitika subdivision of North Westland, and it was decided that displays of the mineral wealth of New Zealand should be sent to all the exhibitions of the world. Four parties were in the field during 1906. The goldfields of the Coromandel subdivision of the Hauraki division of Auckland were investigated prior to the compilation of a report. Iron ore and building-stone were found to be plentiful in the Parapara subdivision of the Karamea division of Nelson. In the Mikonui subdivision of North Westland, moderate deposits of alluvial gold, quartz reefs, copper, asbestos, and coal were found. Building-stone, soapstone, and the water-power of numerous streams give promise of satisfactory development. Meanwhile, topographical and geological maps of each subdivision were compiled, and a beginning was made with the preparation of more detailed descriptions. Work was also proceeded with in the Cromwell subdivision of West Otago.

#### POLAR REGIONS.

**Peary's New Arctic Expedition.**—Commander Peary's preparations for his new expedition in the *Roosevelt* were reported as virtually complete early in July, and on the 17th of the month he despatched a message by wireless telegraphy, announcing his departure for the north from Sydney, Capé Breton. He intends to adhere to his former plan of campaign, proceeding by the Smith sound route to his winter quarters on the northern shore of Grant Land. He hopes, however, that he may be able to start for the pole with fully loaded sledges from the big lead found by him on his last expedition in about 84° N. He takes with him sounding apparatus, and will endeavour to obtain a line of soundings from Grant Land to the pole. The expedition is expected to occupy two years.

**Dr. Charcot's New Expedition.**—Writing early last month, Dr. Charcot obligingly communicated to us a statement as to the equipment and plans of his

new Antarctic expedition. Preparations had been energetically pushed forward, and were sufficiently advanced to lead Dr. Charcot to hope that a start might be made from Havre about the end of the month. Dr. Charcot's ship, as has already been mentioned in the *Journal*, was specially built for the expedition at St. Malo, by Gautier père. She is named the *Pourquoi pas?*, and is a barquentine with auxiliary engine of 550 H.P., measuring  $141\frac{1}{2}$  feet by  $29\frac{1}{2}$  feet, with a draught of  $15\frac{1}{2}$  feet. She can carry 100 tons of supplies and 250 tons of coal. The former have been obtained in France, England, Germany, and Norway; much help in procuring the polar equipment from the last-named having been given by Mr. Crichton-Somerville, of Christiania. The scientific equipment, which has been supplied in part by the Prince of Monaco, the French Naval Department, and the Paris Museum, is of the most approved description. Besides the leader (also captain of the ship), who will pay special attention to bacteriology and hygiene, the personnel includes (of the naval staff) M.M. Bougrain (who will have charge of the hydrographical and allied observations), Rouch (oceanography, meteorology, etc.), and Godfroy (tidal and chemical observations), together with the civilians M.M. Gourdon (geology and glaciology), Gain and Liouville (natural history), and Senouque (terrestrial magnetism and photography). Dr. Charcot's aim is the exploration of Alexander Land, and he expects to be absent two years.

#### MATHEMATICAL AND PHYSICAL GEOGRAPHY.

**Lake Ramparts.**—This is a name given in some parts of the United States to the well-marked lines of boulders which border the shores of many lakes in the Sierra region and elsewhere, while the shallow water on the margin of the lakes may be quite free from them. They have been explained by Prof. G. K. Gilbert as the result of the action of ice on the lake-shores, and his explanation has met with general acceptance. In the *Sierra Club Bulletin* for January, 1908, Prof. Gilbert reproduces some photographs in which this feature is particularly well brought out, and he also gives a clear exposition, with diagrams, of the way in which the ice may be supposed to act. The outward force which it exerts, and by which the boulders lying in the shallow water are gradually pushed on to the shore-line, must be due to expansion following on a rise of temperature, the original covering of ice having been previously fissured during severe cold, the cracks being then filled up by freshly formed ice. An instance of similar action in the case of a German lake was noted in the *Journal* for May, 1907 (p. 599).

**The "Respiration" of Lakes.**—The respiration of an inland lake was the subject of an address by Prof. Birge, of Wisconsin, at the annual meeting of the American Fisheries Society in 1907, and this has since been printed in the *Popular Science Monthly* (April, 1908). Like an organism, the lake has its birth, periods of growth, maturity, and death. Morphologically, it is a simple entity, more like a gigantic *Amoeba* than a highly organized being. The respiratory substance, comparable with the blood, is water. This holds many organized and actively living parts in the form of plants and animals, which correspond to the cells of the blood. External respiration takes place through the absorption and return of gases. Internal respiration consists of the gaseous exchange between the organisms and the water surrounding them. The inland lake in northern latitudes takes a full inspiration at the fall of the year, when the temperature is uniform. It takes another in early spring, when the wind shuffles and reshuffles the strata. Imperfect respiration occurs in summer, when the layer of light water on the surface prevents circulation. During the winter ice covers the lake, and the air is excluded. The supply of oxygen which is necessary for the life of fishes is thus dependent on various conditions. In a deep lake, fish cannot live at the bottom

unless the green plants therein can absorb the carbon from the carbon dioxide and liberate enough oxygen by means of light. If the water is hard through the presence of bicarbonates of calcium and magnesium, the growing algae withdraw carbon dioxide from the bicarbonates; the former remains in the water to be used by plants. The water in addition becomes alkaline, and absorbs carbon dioxide from the air. We are accustomed to think that the food-producing capacity of the lake is the factor which determines the supply of fish which it can produce. The respiratory capacity of the lake may have even greater influence in this matter.

#### GENERAL.

**Honour to Captain Scott.**—Among the awards to distinguished geographers made by the Berlin Geographical Society for 1908, that of the *Nachtigal* gold medal to Captain Scott, leader of the recent British Antarctic Expedition, will be learnt with pleasure by Captain Scott's many friends in this country and elsewhere. In handing the medal to Sir Frank Lascelles, British Ambassador at Berlin, the President, Herr Hellmann, remarked that, the same medal having been awarded to Dr. E. von Drygalski on the return of the German Antarctic Expedition, it had been the wish of the governing body to bestow some mark of appreciation on the other Antarctic expeditions as well. It being impossible to bestow a medal on all the leaders of these expeditions, it had been decided to award the *Nachtigal* medal to Captain Scott, leader of the expedition which had been most fruitful of all in results, while the remaining gentlemen were made Honorary or Corresponding Members of the society. The occasion (May 23, 1908) was the eightieth anniversary of the founding of the society, and among other recipients of honours were the veteran geographer, Dr. Hermann Wagner of Göttingen (who received the *Karl Ritter* Gold Medal), and Lieut. Filchner and Dr. Tafel, the well-known explorers of North-East Tibet.

**Geography at Glasgow University.**—We are pleased to learn that a movement has been set on foot at Glasgow for the establishment in that university of a lectureship in geography, with a yearly salary of £450.

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#### OBITUARY.

##### Carl Christian Koldewey.

THE death on May 17 last, only a short time after his retirement from office, of Captain Carl Christian Koldewey, for thirty-one years superintendent of the Instrument Department of the Imperial German Maritime Observatory, removes from the ranks of the living one whose name will always stand as a landmark in the history of German navigation and Arctic exploration. To a memoir in the *Annalen der Hydrographie* (vol. 36, No. 6) we are indebted for the following particulars: Born October 26, 1837, the son of a merchant at Bücken, in the then kingdom of Hanover, he began active life (1853) as cabin boy. Mostly on his own basis, in hard-won intervals of service, he passed the successive marine examinations, and in 1866 made a voyage round the north cape to Archangel. His thirst for knowledge was, however, not to be quenched by the allowance necessary for the mere practical official. Accordingly, we find him (1866–8) studying the higher mathematics, etc., at Göttingen university, and with such success as to gain not only the mathematical prize, but, in a letter from his teacher to Dr. Petermann, the encomium of being “a man of quite exceptional gifts.” It was solely in recognition of his merit that he was appointed leader of the first German polar

expedition in the *Germania*, which set out on May 24, 1868, returning the 30th September following. With limited means and restricted to one season, the expedition cannot be said to have been more than tentative. It brought home no "conquests," but a store of scientific observations and hard-bought experience in ice navigation. Within eight months of the return of this expedition, thanks in great part to Koldewey's missionary zeal and expert knowledge, a second expedition was completely organized and equipped on a much more adequate basis than the first. A new and larger *Germania*, with an attendant transport, again under Koldewey's leadership, and amid an outburst of official festivities, left Bremerhaven on June 15, 1869. Forearmed against the ice, the *Germania* this time reached the east coast of Greenland, pushing north till beset with ice; and then, having recourse to sledges, Koldewey crossed the 77th parallel. Bringing home a good account of its mission, the expedition, on September 10, 1870, touched the shores of a reconstituted Germany. Henceforth Koldewey was looked up to as a polar authority. Having made the acquaintance of its director, he, in 1871, accepted an appointment in the North German Marine Observatory, and on its reorganization as an imperial establishment entered the imperial service on January 1, 1875. The part he took in the reorganization of the observatory enters, as an important factor, into the modern history of Germany. The observatory, as he found it, was far behind the scientific standard of the time; and among other services were the introduction of tests for compasses by methods worked out by himself in conjunction with Eylert, and great improvements in German nautical-astronomical instruments. The fruit of many years' study is gathered up, more particularly, in his works entitled, 'The Compass on Board Ship' (1889), and in 'Remarkable Change in the Steering Compass of the German Ship *Phœnicia* during its First Year of Service' (1897). Manifold practical suggestions, drawn from his experience, are to be found in papers contributed by him to scientific journals.

### Cesareo Fernandez Duro.

By the death of Captain Cesareo Fernandez Duro Spain mourns for one of her most distinguished men of letters, and we have to regret the loss of an Honorary Corresponding Member, who was always ready to communicate all the information in his power whenever a question was submitted to him. He died last June, at his residence in Madrid, after a long illness.

Having completed his naval service, Captain Duro devoted many years of the latter part of his life to historical and antiquarian researches, chiefly with reference to the Spanish navy, and he was the author of numerous works. He was a member of the Royal Academy of History at Madrid, and was for many years its secretary; while the late Marquis of La Vega de Armijo was director. Captain Duro was present at no less than 859 meetings of the Academy before his last illness. He was a member of the Royal Academy "de Bellas Artes de San Fernando." He served on several committees connected with historical research, and his loss will be much felt by his colleagues in Madrid.

Among Captain Duro's numerous works, the one that is best known to English readers is his 'Armada Invencible.' For its preparation his research was indefatigable. He brought to light several documents before unknown, and the treatment of his subject was judicious and impartial. Sir John Laughton says that his own work, 'The Defeat of the Spanish Armada,' and Duro's 'Armada Invencible,' are, in a measure, complimentary of each other, and that both must be studied for a full understanding of the events of the memorable year 1588.

Captain Duro's researches led to the collection of many curious and interesting

details respecting the navy and maritime affairs from very early times. One of his most valuable works, from this point of view, is the 'Arca de Noe.' Among many other interesting bits of information, it contains some details respecting the Basque whale fishery. The 'Arca de Noe' was followed by the 'Disquisiciones Nauticas,' concerning the building, equipment, and armament of ancient ships, the caravels of Columbus, and national flags during the middle ages. Three other volumes of 'Disquisiciones' followed the first, which appeared in 1876.

Then followed the 'Colon y Pinzon,' a volume presented to the Royal Academy of History, discussing the details connected with the voyages of the discoverers of America. In 1896 Captain Duro published his 'Armada Española,' a history of the Spanish navy from the union of the kingdoms of Castille and Aragon. It includes the voyages of discovery of Mondaña, Sarmiento, and others, as well as narratives of naval operations of war. Duro has done a very great service to his country and to naval history. The mantle of Navarrete fell upon his shoulders, and he has worn it with honour and success. He was the Laughton of the Spanish navy. There cannot be higher praise.

C. R. M.

### Johann Palacký.

Johann Palacký, ex-Professor of Geography at the Czech University of Prague, died at Prague on February 23, 1908. Son of the well-known Bohemian historian and politician, he was born on October 10, 1830, studied in Prague, and graduated as Ph.D. and Doctor of Civil Law. After practising for a short time as lawyer, he devoted himself wholly to geography, studying in Paris, and qualifying in 1856 as lecturer on General Comparative Geography at Prague University. He next laboured at Berlin under Karl Ritter and at Munich. Fifty years ago he set himself the task of producing a 'Länderkunde,' based (in spite of Ritter) on natural science, which was published in Czech in 1857-60, and in German in 1858-61, but remained a torso. Palacký was among the first on the continent to draw from Livingstone's reports correct conclusions respecting the orographical structure of the whole interior of Africa. Even during the time of his political activity in the sixties he cultivated science, beginning his phyto-geographical studies, which continued to the end his most absorbing interest. The fruit of these labours appeared in his 'Phyto-geographical Studies' (*Abhand. der Kgl. Böhm. Gesellsch. d. Wissensch.*), which may be regarded as a great phyto-geographical commentary on Hooker's 'Genera Plantarum;' they were not ended till 1884. In 1881 his 'Studies on the Development of the Vegetable Covering of the Earth on Geological Foundation' appeared. Palacký's greatest geographical—particularly biogeographical—activity falls in the eighties and the beginning of the nineties. In 1885 appeared 'The Distribution of Birds on the Earth,' and in 1891 'The Distribution of Fishes.' Written in a peculiarly condensed style, all these works present an unusual wealth of material in small compass. These, and an enormous number of smaller studies and essays, published in various languages, Palacký regarded as preparatory to a 'Chorologie auf Geologischer und Biogeographischer Grundlage,' into which he desired to concentrate his life's work. A severe illness which seized him in his seventieth year, and its consequences, left his design unexecuted. In 1885 he became Extraordinary, and in 1891 Ordinary Professor of Geography; in 1902 he retired from office. He travelled over the whole of Europe, visiting Scandinavia as late as 1907. He was a familiar figure at almost all botanical, zoological, geological, and geographical congresses; and in their debates he always found scope for the display of his comprehensive knowledge, which rested on a

phenomenal memory. As a scholar Palacký was peculiar, and as a man he was odd; but his people and pupils look up to him with admiration as a geographical genius of universal range; they characterize him as "an Adolf Bastian translated into Czech and Geography." They revered him as a teacher who set himself severe tasks, and directed them, as well as himself, exclusively to high aims. Mention should be made, in conclusion, of his Herbarium of 30,000 extra-European plants, arranged according to their geographical regions, which he has bequeathed to the Geographical Institute of the Czech University of Prague.

### Eduard Glaser.

Eduard Glaser, the Arabian explorer, died on May 8 last at Munich, where he had been living since 1896. Born March 15, 1855, at Deutsch-Rust, in Bohemia, he studied physics, astronomy, geology, and mathematics, first at the technical high school in Prague, and then at the universities of Vienna and Prague. Engaged from 1878 at the Vienna observatory, he at the same time acquired a knowledge of Oriental languages at the Oriental Academy in Vienna, and afterwards, as teacher in Tunis and Egypt, a readiness in the use of the Arabic language. He made his first journey to Arabia in 1882-84, and this was followed up by three other journeys, in 1885-86, 1887-88, and 1892-94 respectively. The results of these travels are of a topographical, and especially of an archaeological, character, and have to do with the west and south of the great peninsula. Of especial value are the collections of inscriptions and manuscripts he brought home with him. A series of publications giving account of the geographical results of his travels lie scattered in *Petermanns Mitteilungen*, *Ausland*, *Akademie*, etc. Among his writings published independently is to be noted his 'Sketch of the History and Geography of Arabia from the Earliest Times down to the Time of the Prophet Muhammad,' which appeared in 1889-90.

### Dr. Ferdinand Löwl.

We regret to have to record the death, on May 1 last, from a fall on the much-frequented Geisberg near Salzburg, of Dr. Ferdinand Löwl, the Austrian geographer and geologist, professor of geography at the University of Czernowitz in Bukovina. Son of a major in the cuirassiers, he was born on May 7, 1856, at Prossnitz, in Moravia. He studied geology, geography, and history in Prague, Vienna, and Bonn. In 1881 he attained the position of lecturer in geography in Prague, and in 1887 was called to the post of extraordinary professor in Czernowitz. As a pupil of Eduard Suess, he already conceived that love of the Alps which was destined to make him one of the exponents of their upper world, and finally to cost him his life. His work 'Aus dem Zillertaler Hochgebirge' is prized as a jewel of German Alpine literature; his scientific writings, too, mostly concern the Alps: his original and solid work on 'Modes of Settlement in the High Alps' (1887) is purely geographical; his later publications are more of a geological character, such as his 'Rund um den Grossglockner' (1898) and others dispersed in the *Jahrbuch der k.k. Geol. Reichsanstalt*, the *Zeitschrift* of the German and Austrian Alpine Club, and *Petermanns Mitteilungen*. His chief work, 'Geologie,' published in 1906, and intended as a handbook for the use of geographers, is by competent judges pronounced to be "in the best sense the most modern comprised in German geographical literature." Physically a genuine German of giant mould, Ferdinand Löwl was a scientific investigator who questioned Nature with a mind all his own, and a character of marked fidelity to his own convictions.

**Major-General Shaw Stewart.**

Major-General J. H. M. Shaw Stewart, R.E., whose death, at the age of seventy-six years, occurred on July 6, had been a Fellow of the Society for forty-eight years, and had served on its Council from 1903 to 1907. He entered the army in 1851, and had served many years in India, besides commanding the Madras Sappers during the China campaign of 1860. During the latter part of his life in India, which terminated on his retirement in 1885, he had held the post of Chief Secretary for Public Works to the Madras Government, and was also a member of the Madras Legislative Council.

**CORRESPONDENCE.****Southern Nigeria.**

28, Jermyn Street, S.W.

In the *Geographical Journal* of last month (July), Lieut. E. A. Steel, in his very interesting paper entitled "Exploration in Southern Nigeria," describing the little-known northern district between the Niger and Cross river, states (p. 7) that the "dreaded Juju oracle at Arochuku was destroyed during the military operations of 1902." The punitive expedition against the Aros was led by Colonel Montanaro during the governorship of Sir Ralph Moor in southern Nigeria, and fighting commenced in December, 1901. Although the operations were short and sharp, the force was not withdrawn for some months, as their presence was necessary to prevent a recurrence of hostilities. Arochuku (formerly Iboum), the stronghold of the Long Juju, was stormed and burned on Christmas Eve, and for three days there was continuous sniping and night attacks by the dispossessed people, who lurked in the bush beyond the cleared belt surrounding the town. Although I have not my diary to hand, I believe the ravine in which the Long Juju was situated, a mile or so from Arochuku, was discovered and destroyed before the New Year. The defeat of the Aros in their stronghold was so decisive that the military detachments had no difficulty in disarming the natives of the surrounding villages, and it was only in certain cases that settlements had to be destroyed. In 1902 Major Venour contributed a paper to this journal on this district, and in 1902 I wrote a short illustrated account for the Scottish Geographical Society, which was published in the latter half of the same year. Major Leonard has also described the religion of the Long Juju in his book published last year. Although a history of the Juju religion in this district might almost equal that of Benin for the horrors connected with it, the country is much poorer, and did not provide a booty in any way to be compared with that of Benin.

DONALD MACALISTER.

**MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY,  
SESSION 1907-1908.**

*Sixteenth Meeting, June 29, 1908.*—Major LEONARD DARWIN, President, in the Chair.

**ELECTIONS.**—Rule Alan Barclay; Robert Arnolds Becher; Captain C. N. French (*General Staff, Hampshire Regiment*); J. S. Bishop; Henry van der Ben Copeland; J. F. K. Dillon; James Olden Hatcher; William Hill Hazell; Francis Joseph Heherr; John Lewis Longstaffe (*Lancashire Field Artillery*); Rev. Ernest Millar; Norman Frederic Richardson; Captain Godwin Rupert Wake (*2nd Northumberland Fusiliers*); Thomas Robert Warner; Sir George Earle Welby, C.M.G.; Francis Renken Widdows; J. M. Williams.

## THE PRINCE OF MONACO—PRESENTATION OF MEDAL.

The PRESIDENT said: Every Fellow present here to-night is no doubt aware that our Patron's Medal, the highest award in the gift of the Society, was this year assigned to H.S.H. the Prince of Monaco, whom we cordially welcome here to-night. Owing to ill health, His Highness was unfortunately unable to be present at our annual meeting, and the fact that he has, as I believe, arranged his visit to England with especial reference to this evening's meeting, and to the opportunity it affords for presenting that medal, is one that we all sincerely appreciate. In every branch of science there are a limited number of persons who are acknowledged to be its leading experts. In some branches of sciences there are also a still more limited number of persons who are known as the generous contributors to the funds now generally found absolutely indispensable for the pursuit of science. But it is indeed very rare to find, as in the case of the Prince of Monaco, the same individual playing both these rôles at once—being, that is, at the same time an independent investigator of the highest order, and a munificent patron of science. My main object, however, in calling attention to these two aspects of the Prince of Monaco's connection with oceanographic research is to make it clear that the medal is awarded with reference to one of them only. If His Highness had merely created a unique museum in his principality; if he had merely endowed oceanographical research in France with princely liberality; if he had merely done this—and we know he has done this and more than this—grateful as the Council would have been to him for the benefits which science has thus received, they would not have selected him as the recipient of the Patron's Medal. That medal is awarded solely on account of his own personal distinction as a man of science, having, of course, especial reference to geographical science, and his work in connection with the mapping of the floor of the ocean. It would not be seemly in his presence to enumerate his scientific works; nor is it necessary to do so, because they are well known, and because they are set forth in the annals of this Society in connection with this award. I would, on this occasion, rather venture to repeat a remark which I made at our annual dinner, when I was, in the absence of the Prince, proposing the health of the Gold Medalists. I am glad to repeat it in the presence of so many Fellows, because I am certain they will endorse it. I then said, and I say now, that I hope the Prince of Monaco will accept the Patron's Medal, not only as a fitting recognition of his distinguished scientific work, but also as a token that, in his future voyages of investigation in his yacht the *Princesse Alice*, he will always be accompanied, as it were, by the hearty good wishes of the Royal Geographical Society.

Before handing the Patron's Medal to its recipient, I should like to state that our Vice-Patron, H.R.H. the Prince of Wales, wrote to express his regret that he was unable to be present here to-night when the Patron's Medal is presented.

Now, Your Highness, as the representative of the Royal Geographical Society, allow me to have the honour of handing you this medal.

H.S.H. the PRINCE OF MONACO: The distinction so flattering to me which the Royal Geographical Society has just been good enough to confer on me is a powerful encouragement, and affords great satisfaction to me in my scientific life. I am full of gratitude to the British men of science who have chosen me for this honour; all the more so, that it furnishes me with the opportunity once more to tell you how much I esteem their devotion to science, and how high a value I place on the sympathy which they have testified towards my efforts for the intellectual development of humanity. But if I have been able to obtain those results which your President has just recalled, it is principally due to the brilliant scientific staff with

which I have been surrounded for the last twenty years, and which forms an international cordon round the department of oceanography. I accept, therefore, the great medal of the Society with all the more joy and pride, as the distinction will be reflected on all the companions of my work.

The paper read was—

"Some Aspects of the Nile Valley." By Captain H. G. Lyon\*, F.R.S. (Director of the Egyptian Survey).

## GEOGRAPHICAL LITERATURE OF THE MONTH.

### *Additions to the Library.*

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are as a rule written in full :—

A. = Academy, Academie, Akademie.  
 Abh. = Abhandlungen.  
 Ann. = Annals, Annales, Annalen.  
 B. = Bulletin, Bollettino, Boletim.  
 Col. = Colonies.  
 Com. = Commerce.  
 O.R. = Comptes Rendes.  
 E. = Erdkunde.  
 G. = Geography, Géographie, Geografia.  
 Ges. = Gesellschaft.  
 I. = Institute, Institution.  
 Is. = Ivestiya.  
 J. = Journal.  
 Jb. = Jahrbuch.  
 k.k. = kaiserlich und königlich.  
 M. = Mitteilungen.

Mag. = Magazine.  
 Mem. (Mém.) = Memoirs, Mémoires.  
 Met. (mét.) = Meteorological.  
 P. = Proceedings.  
 R. = Royal.  
 Rev. (Riv.) = Review, Revue, Rivista.  
 S. = Society, Société, Selakab.  
 Sc. = Science(s).  
 Sitzb. = Sitzungsbericht.  
 T. = Transactions.  
 Ta. = Tijdschrift, Tidskrift.  
 V. = Verein.  
 Verh. = Verhandlungen.  
 W. = Wissenschaft, and compounds.  
 Z. = Zeitschrift.  
 Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 x 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

### EUROPE.

- Alps—St. Bernard.** *Hilfiker.*  
*Vierteljahrschrift Naturforsch. Ges. Zürich* 52 (1907): 364-381.  
 Ein neues Präzisionsnivellement auf den Grossen St. Bernhard. Von J. Hilfiker.
- Alps—Snow-line.** *Mougin.*  
*Z. Gletscherkunde* 2 (1908): 285-292.  
 L'altitude de la ligne des neiges et son relèvement actuel dans les Alpes de la Savoie. Par P. Mougin.
- Alps—Structure.** *Heim.*  
*Neujahrsblatt, Naturforsch. Ges. Zürich*, No. 110 (1908): pp. 26.  
 Der Bau der Schweizeralpen. Von Dr. Alb. Heim. *Sections and Illustrations.*
- Austria—Communications.** *Jauker.*  
*G. Anzeiger* 9 (1908): 73-78.  
 Das geographische Element bei den Römerstrassen. Von Prof. Dr. O. Jauker.  
*Map.*  
 See note in the July number, p. 82.
- Balkan Peninsula—Railways.** *Richardson.*  
*Scottish G. Mag.* 24 (1908): 254-258.  
 New railway projects in the Balkan peninsula. By Ralph Richardson. *Sketch-map.*
- Belgium—Ardenne.** *Bahir.*  
*Spelunca* 7 (1908): No. 51, pp. 22.  
 Etude spéléologique des environs de Goyet et de Hotton (Belgique). Par Ed. Bahir. *Sketch-maps, Illustrations, and Sections.*

- Danube.** *M. k.k. G. Ges. Wien* 51 (1908): 57-58. **Schaffer.**  
 Neue Forschungen in den alten Terrassen des Donaugebietes. Von Dr. F. X. Schaffer.
- Europe—Anthropology.** **Reinhardt.**  
 Der Mensch zur Eiszeit in Europa und seine Kulturentwicklung bis zum Ende der Steinzeit. Von Dr. Ludwig Reinhardt. Munich: E. Reinhardt, 1908. Size  $9\frac{1}{2} \times 6\frac{1}{2}$ , pp. viii. and 922. *Sketch-maps and Illustrations.* Price 12m. Presented by the Publisher.
- Europe—Historical.** **Waddington.**  
 Richard Waddington. La guerre de sept ans: histoire diplomatique et militaire. Tome iv. Paris, [1907]. Size  $9 \times 6$ , pp. viii. and 638. *Maps and Facsimile Plans.*
- France.** **Prothero.**  
 The pleasant land of France. By Roland E. Prothero. London: J. Murray, 1908. Size  $9 \times 5\frac{1}{2}$ , pp. viii. and 360. Price 10s. 6d. net. Presented by the Publisher.
- France.** **Reclus.**  
 Onésime Reclus. La France à vol d'oiseau. 2 vols. Paris: E. Flammarion, [not dated; 1908]. Size  $7\frac{1}{2} \times 4\frac{1}{2}$ , pp. (vol. 1) 566; (vol. 2) 560. Price 10 fr. Presented by the Publisher.
- France—Haute-Loire.** *An. G.* 17 (1908): 105-127. **Locussol.**  
 Les régions naturelles du Velay. Par Eugène Locussol. *Sketch-map and Sections.*
- Germany—Alsace.** *Deutsche Rundschau G.* 30 (1907-8): 289-298. **Tschaeche.**  
 Der Sundgau. Von F. Tschaeche. *Map.*  
 This term is applied by the writer to the undulating tract between the Jura and the Vosges, which was the site of a movement of depression in Tertiary times. (See July number, p. 83.)
- Germany—Bavaria.** *M.G. Ges. München* 3 (1908): 1-18. **Heller.**  
 Die Tätigkeit des bayer. Topographischen Bureaus in den letzten 10 Jahren. Von Generalmajor Heller. *Maps.*
- Germany—Bavaria.** *Globus* 93 (1908): 261-265. **Jaeger.**  
 Bruck an der Amper. Von Julius Jaeger. *Sketch-map.*  
 Sketches the physical geography of the surroundings, as well as the history, etc., of the place.
- Germany—Bavaria.** **Schwender.**  
*Forschungen deuts. Landes- u. Volksk.* 17 (1908): 1-118.  
 Der Steigerwald. Ein Beitrag zur Geographie Frankens. Von Dr. Jakob Schwender. *Maps.*
- Germany—Rhine.** *Ts. K. Ned. Aard. Genoots.* 25 (1908): 1-39, 253-287. **Lorié.**  
 De terrassen langs den rechter Rijnsoever, beneden het zevengebergte. Door Dr. J. Lorié. *Maps.*
- Hungary—Orography.** **Gorjanović-Kramberger.**  
*Abh. K. Preuss. A.W.*, 1907; *Anhang, Phys. Abh.*, No. 1: pp. 30.  
 Die geotectonischen Verhältnisse des Agramer Gebirges und die mit denselben in Zusammenhang stehenden Erscheinungen. Von Dr. Karl Gorjanović-Kramberger. *Maps.*
- Hungary—Relief.** *Abrégé B.S. Hongroise G.* 36 (1908): 33-46. **Gorjanović-Kramberger.**  
 War das Zagreber Gebirge vergletschert und wie ist die Zagreber Terasse entstanden? Eine kritische Studie von Gorjanović-Kramberger. *Illustrations and Sections.* [*Földrajzi Közlemények* 36 (1908): 87-97.]
- Hungary—Settlement.** *Abrégé B.S. Hongroise G.* 36 (1908): 20-29. **Horváth.**  
 Siedlungsgeographie des Zala-Tales. Von Károly Horváth. [*Földrajzi Közlemények* 36 (1908): 50-70. *Sketch-map, Illustrations, and Section.*]
- Iceland.** **Gratacap.**  
*Popular Sc. Monthly* 70 (1907): 289-302, 420-432, 560-567; 72 (1908): 79-90.  
 A trip around Iceland. By L. P. Gratacap. *Illustrations.*  
 Includes many observations on the physical geography, well illustrated by the photographs.
- Italy—Campania.** **Günther.**  
 A bibliography of topographical and geological works on the Phlegrean Fields.

By R. T. Günther. London: B.G.S., 1908. Size  $10 \times 6\frac{1}{2}$ , pp. viii. and 100.  
*Price (to Fellows) 3s. net; (to non-Fellows) 6s. net.*

A well-nigh exhaustive bibliography, the result of much labour and research.

**Italy—Campania.**

**Oestreich.**

Die Phlegräischen Felder. Von Dr. Oestreich. (Sonderabdruck aus den Sitzungsberichten der Gesellschaft zur Beförderung der gesamten Naturwissenschaften zu Marburg, No. 1, 9 Januar, 1907.) Size  $8\frac{1}{2} \times 5\frac{1}{2}$ , pp. 10.

**Italy—Landslips.**

*Mem. S.G. Italiana* 13 (1907): pp. 346.

**Almagia.**

Studi geografici sulle frane in Italia. Del dott. Roberto Almagia. Vol. 1. *Maps and Illustrations.*

**Italy—Sardinia.**

*Globus* 93 (1908): 245-249, 266-269.

**Wagner.**

Das Nuorese. Ein Reisebild aus Sardinien. Von Max Leopold Wagner. *Illustr.*

**Mediterranean.**

**Reynolds-Ball.**

Mediterranean Winter resorts: a complete and practical handbook to the principal health and pleasure resorts on the shores of the Mediterranean. . . . By Eustace Reynolds-Ball. 6th edit. London: Hazell, Watson, & Viney, 1908. Size  $6\frac{1}{2} \times 4$ , pp. 646. *Map. Price 6s. Presented by the Publishers.*

Claims to be rather a new book than a new edition.

**Portugal—Ornithology.**

**Carlos.**

Catalogo illustrado das aves de Portugal (sedentarias, de arribação e accidentaes). Por D. Carlos de Bragança. Fasciculos 1-2. Lisbon, 1903-1907. Size  $13 \times 10$ . *Plates (with text in Portuguese and French). Presented by King Manuel II. of Portugal.*

All published of an extensive work planned by the late king.

**South-East Europe.**

Guide to Greece, the Archipelago, Constantinople, the coasts of Asia Minor, Crete, and Cyprus. (3rd edit.) London: Macmillan & Co., 1908. Size  $7 \times 4\frac{1}{2}$ , pp. 1. and 226. *Maps and Plans. Price 9s. net. Presented by the Publishers.*

**Spain—Huesca.**

**Briet.**

Le bassin supérieur du Rio Vero (Haut-Aragon, Espagne). Par Lucien Briet. Château-Thierry, 1908. Size  $10\frac{1}{2} \times 7$ , pp. 92. *Map, Plans, and Illustrations.*

**Spain—Popular Geography.**

*B.R.S.G., Madrid* 49 (1907): 402-424.

**Vergara.**

Refrescos, modismos y cantares geográficos empleados en España, con relacion á otros pueblos. Por Gabriel Maria Vergara.

**Sweden—Rivers.**

*Ymer* 27 (1907): 143-179.

**Wallén.**

Till kännedom om Lagans och Nissans hydrografi. Af Axel Wallén. *Diagrams.*

**Sweden—Timber.**

*Ymer* 27 (1907): 315-374.

**Andersson.**

Timmertransporten på de svenska vattendragen och dess geografiska förutsättningar. Af Gunnar Andersson. *Map, Illustrations, and Diagrams.*

On the floating of timber down the Swedish rivers in relation to geographical conditions. (See note in the Monthly Record, ante, p. 181.)

**Switzerland.**

**Clerget.**

Pierre Clerget. La Suisse au XX<sup>e</sup> siècle: étude économique et sociale. Paris: A. Colin, 1908. Size  $7\frac{1}{2} \times 5$ , pp. 268. *Price 3.50 fr. Presented by the Publisher.*

**Switzerland—Fribourg.**

*B.S. Neuchatel. G.* 13 (1907): 88-97.

**Michel.**

Contribution à l'étude des cours d'eau du plateau fribourgeois. Gérine, Gotteron. Tafelna. Par Gaston Michel. *Sketch-maps and Illustrations.*

See note in the June number, p. 670.

**Switzerland—Geodesy.**

Internationale Erdmessung. Astronomisch-geodätische Arbeiten in der Schweiz (Försetzung der Publikation: "Das schweizerische Dreiecknetz") herausgegeben von der Schweizerische geodätischen Kommission. X. Band. Zürich, 1907. Size  $12\frac{1}{2} \times 9\frac{1}{2}$ , pp. xi. and 408. *Maps and Diagrams.*

**Switzerland—Neuchatel.** *B.S. Neuchatel. G.* 13 (1907): 47-74.

**Tissot.**

Terrains et associations de plantes de la région de la Chaux-de-fonds. Étude de géographie botanique par le Dr. E. Robert Tissot. *Map and Illustrations.*

**Switzerland—Neuchâtel.** *B.S. Neuchâtel. G. 18* (1907): 5-46.

Le lac de Saint Blaise : Histoire, Hydrographie, Faune des Invertébrés. Par le Club des Amis de la Nature de Neuchâtel. *Map, Sections, and Illustrations.*

**Turkey—Macedonia.**

Macedonia and the reforms. By Draganof. Preface by Victor Bérard. London, 1908. Size 8½ × 5½, pp. xxvi. and 294. *Map. Presented by George J. Planinsky, Esq.*

**United Kingdom—Devon and Cornwall.**

Lewis.

The Stannaries : a study of the English tin-miner. By Dr. George Randall Lewis. London : A. Constable & Co., 1908. Size 9 × 6, pp. xviii. and 300. *Price 6s. net. Presented by the Publishers.*

**United Kingdom—Hebrides.**

Abraham.

Rock-climbing in Skye. By Ashley P. Abraham. London : Longmans, Green, & Co., 1908. Size 9 × 6, pp. xxii. and 330. *Maps and Illustrations. Price 21s. net. Presented by the Publishers.*

**United Kingdom—Historical.**

Dann.

Historical geography on a regional basis. By Ernest W. Dann. The British Isles. Vol. 1. London : J. M. Dent & Co., 1908. Size 7 × 5, pp. xii. and 182. *Maps. Price 2s. 6d. net. Presented by the Publishers.*

**United Kingdom—Ireland.** *Symons's Meteorol. Mag. 43* (1908): 2-4.

Boeddicker.

Black rain in Ireland, October 8 to 9, 1907. By Dr. Otto Boeddicker. *Sketch-map.*

A very considerable deposit of soot resulted from this rain, chiefly in the centre of Ireland. (See April number, p. 440.)

**United Kingdom—Meteorology.**

Meteorological Observations at stations of the second order for the year 1903. London : Meteorological Office, 1908. Size 12 × 10, pp. xiv. and 170. *Index-map.*

**United Kingdom—Meteorology.** *Quarterly J.R. Meteorol. S. 34* (1908): 1-5.

Dines.

The registering balloon ascents in England of July 22 to 27, 1907; preliminary account. By W. H. Dines. *Diagram.*

**United Kingdom—Scotland.**

Richardson.

Illustrated pocket guide to Melrose, Abbotsford, etc. (The land of Scott.) By Ralph Richardson. 3rd edit. Edinburgh : J. Bartholomew & Co., [1908]. Size 6½ × 4½, pp. viii. and 62. *Maps, Plans, and Illustrations. Price 6d. net. Presented by the Publishers.*

A thoroughly practical guide.

**United Kingdom—Wales.**

Giraldus.

The Itinerary through Wales and the description of Wales. By Giraldus Cambrensis. London : J. M. Dent & Co. (1908). Size 7 × 4½, pp. xxiv. and 210. *Price 1s.*

**United Kingdom—Waterways.**

Royal Commission on Canals and Waterways. Vol. 3. England and Wales, and Scotland. Minutes of evidence and appendices thereto accompanying the Second Report (Vol. 3, Part 1) of the Royal Commission appointed to inquire into and to report on the canals and inland navigations of the United Kingdom. London, 1908. Size 13 × 8½, pp. x., 644, xiv., and 218. *Map. Presented by the Royal Commission.*

## ASIA.

**Asia—Historical.**

Hallberg.

L'Extrême Orient dans la littérature et la cartographie de l'Occident des XIII<sup>e</sup>, XIV<sup>e</sup>, et XV<sup>e</sup> siècles. Etude sur l'histoire de la géographie. . . . Par Ivar Hallberg. Göteborg, 1907. Size 10 × 7, pp. viii. and 574. *Presented by the Royal University, Upsala.*

**Central Asia—Tian Shan.** *Z. Gletscherkunde 2* (1908): 241-270.

Friederichsen.

Die heutige Vergletscherung des Khan-Tengri-Massives und die Spuren einer diluvialen Eiszeit im Tiën-Schan. Von Prof. Dr. Max Friederichsen. *Map and Illustrations.*

**China.**

Broomhall.

Present-day Conditions in China; notes designed to show the moral and spiritual claims of the Chinese Empire. By Marshall Broomhall. London : China Inland Mission, 1908. Size 9 × 5½, pp. viii. and 58. *Maps and Illustrations. Price 1s. Presented by the Publishers.*

**China.****Johnston.**

From Peking to Mandalay: a journey from North China to Burma through Tibetan Szech'uan and Yunnan. By R. F. Johnston. London: J. Murray, 1908. Size 9 x 8½, pp. xii. and 460. *Map and Illustrations.* Price 15s. net. *Presented by the Publisher.*

**China—Hunan.****Bons d'Anty.**

*B. Comité Asie française* 7 (1907): 162-164, 197-207: 8 (1908): 97-107.

Missions Pierre Bons d'Anty. I.-III. *Maps.*

**China—Kwantung.***B. Com. Asie française* 8 (1908): 96-97.**Madrolle.**

La mission Madrolle [dans l'île de Haïnan]. *Sketch-map.*

**China—Kwei-chou.***La G., B.S.G. Paris* 17 (1908): 158-161. **Ollone and Fleurelle.**

Mission d'Ollone. Rapport du lieutenant de Fleurelle. *Sketch-map.*

The map shows the travellers' routes in southern Kwei-chou between 105½° and 106½° E., through the country of the Miao and Thais.

**China—Szechuan.****Edgar.**

The Marches of the Mantze. By J. H. Edgar. London: China Inland Mission, [1908]. Size 8 x 5, pp. viii. and 68. *Illustrations.* Price 1s. 6d. *Presented by the Publishers.*

**China and Manchuria.****Chavannes.**

*B. Comité Asie française* 8 (1908): 135-142.

Voyage archéologique dans la Mandchourie et la Chine septentrionale. Par Ed. Chavannes. *Sketch-map and Illustrations.*

**Chinese Empire.****Kozloff.**

Mongolia and Kham. Works of the expedition of the Imperial Russian Geographical Society, during 1899-1901, under the command of P. K. Kozloff. Vol. 2, part i.—My Journeys in Mongolia and Kham. By A. N. Kaznakoff (pp. x. and 186). Vol. 3, part i.—The Astronomical Observations of P. K. Kozloff. By N. A. Tachaloff (pp. 8 and 20). Vol. 5—Materials for the avifauna of Mongolia and Eastern Tibet. By V. Bianki (pp. lviii. and 252). St. Petersburg, 1907. Size 11½ x 8½. *Maps and Illustrations.* [In Russian.] *Presented by the Imperial Russian Geographical Society.*

**Chinese Empire.****Lesdain.**

From Peking to Sikkim through the Ordos, the Gobi Desert, and Tibet. By Count de Lesdain. London: J. Murray, 1908. Size 9 x 6, pp. xii. and 302. *Map and Illustrations.* Price 12s. net. *Presented by the Publisher.*

**Chinese Empire.****Richard.**

L. Richard's Comprehensive Geography of the Chinese Empire and Dependencies. Translated . . . by M. Kennelly. Shanghai: Tuswei Press (London: Luzac & Co.), 1908. Size 9½ x 6, pp. xviii. and 714. *Maps.* Price 12s. *Presented by the Publishers.*

**Chinese Empire—Dzungaria.****Petermanns M.** 54 (1908): 25-39.

Reise im Djair, Urkaschar und Seemistai im Sommer 1906. Von Prof. W. A. Obrutschew. *Map.* Also separate copy, size 11 x 9.

Noticed in the June number, p. 673.

**Chinese Empire—Tibet.***Mem. Geol. Surv. India* 38 (1907): Part 2, pp. 80. **Hayden.**

The Geology of the provinces of Tsang and Ü, in Central Tibet. By H. H. Hayden. *Map, Sections, and Illustrations.*

**Chinese Turkestan.***B. Com. Asie française* 8 (1908): 87-95.**Pelliot.**

La mission Pelliot. *Sketch-map.*

**Dutch East Indies.***Ts. k. Nederland. Aardr. Genoots.* 25 (1908): 40-53. **Rambaldo.**

De luchtvaart ten dienste von het wetenschappelijk onderzoek in Ned.-Indië. Door A. E. Rambaldo.

Suggests the use of balloons for topographical and hydrographical exploration, as well as for the investigation of the upper atmosphere.

**French Indo-China—Tonkin.***Ann. G.* 16 (1907): 430-450. **Zeil.**

Contribution à la géographie tectonique du Haut-Tonkin (feuilles de That-khé, de Pho-binh-gia et de Loung-Tchéou). Par G. Zeil. *Sketch-maps, Sections, and Illustrations.*

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P

- India—Bengal.** *P.R. Philos. S. Glasgow* 38 (1906-07): 70-80. **Macphail.**  
 The Santals of Bengal. By Dr. James A. Macphail. *Illustrations.*
- India—Himalaya.** *Alpine J.* 24 (1908): 63-67. **Rubenson.**  
 An ascent of Kabru. Narrative of Mr. Rubenson.  
 See note in the Monthly Record for January, p. 102.
- India—Survey.**  
 Extracts from Narrative Reports of the Survey of India for the season 1905-1906.  
 Prepared under the direction of Colonel F. B. Longe. Calcutta, 1907. Size  
 13½ x 8½, pp. 116. *Presented by the Surveyor-General of India.*  
 See note in the July number, p. 83.
- Japan—Formosa and Lu-chu.** *B.S.R. Belge G.* 31 (1907): 435-461. **Denucé.**  
 Les îles Lequios (Formose et Riou-kiu) et Ophir. Par J. Denucé.
- Korea.** **Ladd.**  
 In Korea with Marquis Ito. Part i. A narrative of personal experiences;  
 part ii. A critical and historical inquiry. By George Trumbull Ladd, LL.D.  
 London: Longmans, Green, & Co., 1908. Size 8½ x 5½, pp. xiv. and 478.  
*Illustrations. Price 12s. 6d. net. Presented by the Publishers.*
- Malay Archipelago—Bali.** **Nieuwenkamp.**  
*Ts. h. Nederland. Aardr. Genoots.* 25 (1908): 54-76.  
 De eerste bestijging van den heiligen vulkaan Batoer op Bali, November 2, 1906.  
 Door W. O. J. Nieuwenkamp. *Sketch-map and Illustrations.*
- Malay Archipelago—Celebes.** **Sarasin.**  
 Versuch einer Anthropologie der Insel Celebes. Von Dr. Paul Sarasin und Dr.  
 Fritz Sarasin. Erster Teil: Die Toala-Höhlen von Lamontjong (pp. 62); Zweiter  
 Teil: Die Varietäten des Menschen auf Celebes (pp. viii. and 164). (Materialien  
 zur Naturgeschichte der Insel Celebes; V. Band, 1. und 2. Teile.) Wiesbaden,  
 1905-1906. Size 12½ x 10. *Illustrations. Price 68s.*  
 A section of the monumental work on the results of the scientific labours of the  
 Sarasins in Celebes.
- Malay Archipelago—Sumatra.** *M. k.k. G. Ges. Wien* 50 (1907): 379-401. **Pick.**  
 Das Gajoland und seine Bewohner. Von Dr. Richard Pick.
- Russia—Siberia.** *Globus* 93 (1908): 133-139. **Brecht.**  
 Das Salz- und Bitterseengebiet zwischen Irtysh und Ob. Von R. Brecht.  
*Sketch-map, Illustrations, and Sections.*
- Russia—Siberia—Tunguses.** **Patkanoff.**  
*Zapiski Imp. Russ. G.S., Ethnography* 31 (1906): pp. xii., 26, 180, 284, and 210.  
 Attempt at a geographical and statistical account of the Tungus tribes of Siberia,  
 prepared from the data of the census of 1897. By S. Patkanoff. *Maps.* [In  
 Russian.]
- Turkey—Asia Minor.** **Wiegand.**  
 Königliche Museen zu Berlin. Milet. Ergebnisse der Ausgrabungen und Unter-  
 suchungen seit dem Jahre 1899, herausgegeben von Theodor Wiegand. Heft I.  
 Karte der Milesischen Halbinsel (1: 50,000), mit erläuterndem Text von Paul  
 Wilski. Berlin: G. Reimer, 1906. Size 14 x 10½, pp. 24. *Maps and Illustrations.*  
*Price 5m.*  
 The first of a series of monographs to be issued as material offers. The large-  
 scale contoured map shows the localities of all the antiquities still remaining.
- Turkey—Railway.** *B.S.G. Com. Havre* 24 (1907): 235-249. **Vanier.**  
 Le chemin de fer de Konia-Bagdad. Par Ferd. Vanier.  
 Takes an unfavourable view of the prospects of the line, which has not yet crossed  
 the Taurus.

## AFRICA.

- Abyssinia—Language.** *B.S.G. Italiana* 9 (1908): 368-380, 452-466. **Bieber.**  
 Dizionario della lingua caffee, raccolto nel Caffa da Federico G. Bieber.
- Africa, North-Central.** *B.S.G. Marseille* 31 (1907): 149-185. **Lahache.**  
 Le désempolement de l'Afrique française est-il démontré? Par J. Lahache. *Map.*  
 The writer thinks that the data are not sufficient to admit a definite answer in the  
 affirmative. (Cf. June number, p. 676.)

- Canary Islands—Palma.** *Z. Ges. E. Berlin*, 1908: 168-186, 222-250. **Gagel.**  
 Die Caldera von La Palma. Von Prof. Dr. Curt Gagel. *Map and Illustrations.*
- Central Africa.** **Arnot.**  
 Pen and picture account of a visit to Central Africa, November, 1906, to January, 1908. By F. S. Arnot. London, etc., 1908. Size  $8\frac{1}{2} \times 6\frac{1}{2}$ , pp. 32. *Map and Illustrations.*
- Congo State—Communications.** *G.Z.* 14 (1908): 65-83, 150-159. **Ghellinck.**  
 Wasserstrassen und Eisenbahnen im freien Kongo - Staat. Von Adrien de Ghellinck. *Map.*
- Congo State—Katanga.** **Lemaire.**  
 Commdt. Lemaire Ch. Mission scientifique du Ka-Tanga. Résultats des observations météorologiques effectuées sur le territoire de l'Etat Indépendant du Congo du mois d'août 1898 au mois de décembre 1899. xvii<sup>e</sup> mémoire. Brussels, 1908. Size  $13 \times 10$ , pp. iv and 194. *Presented by the Author.*  
 Gives in tabular form the results of observations taken at several stations during the course of the Katanga expedition, the longest series being that for Lefoi, which extends over a period of nine months. Hourly values of barometric pressure are given.
- Dahome.** *La G., B.S.G.* 17 (1908): 281-284. **Gaillard.**  
 Le lac Nokoué. Par le Dr. [R.] Gaillard. *Map and Illustration.*
- Egypt—Ports.**  
 Statistical Department, Ministry of Finance. Statistical return of navigation in the ports of Egypt for 1906. Cairo, 1907. Size  $12 \times 8\frac{1}{2}$ , pp. xviii. and 80.
- Egypt—Sinai.** **Barron.**  
 Survey Department, Egypt. The topography and geology of the Peninsula of Sinai (Western portion). By T. Barron. Cairo, 1907. Size  $10\frac{1}{2} \times 7$ , pp. 242. *Maps, Illustrations, and Sections.*
- Egypt—Sinai—Boundary.** **Wade.**  
 Egypt, Survey Department. A report on the delimitation of the Turco-Egyptian boundary between the Vilayet of the Hejaz and the Peninsula of Sinai. (June—September, 1906.) By E. B. H. Wade, together with additions by B. F. E. Keeling and J. I. Craig. (Survey Department, Paper No. 4.) Cairo, 1908. Size  $10\frac{1}{2} \times 7$ , pp. 90. *Map and Plan.* [See Reviews, ante, p. 168.]
- Egypt—Suez Canal.**  
 Statistical Department, Ministry of Finance. Statistical return of navigation through the Suez Canal for 1906. Cairo, 1907. Size  $12 \times 8\frac{1}{2}$ , pp. xxxiv. and 66.
- Egypt and Sudan.**  
 Guide to Egypt and the Sūdān, including a description of the route through Uganda to Mombasa. 5th edition. London: Macmillan & Co., 1908. Size  $7 \times 4\frac{1}{2}$ , pp. xvi. and 178. *Maps and Plans.* Price 5s. net.
- Eritrea.** **Dainelli.**  
 Giotto Dainelli. In Africa (Lettere dall' Eritrea). Parte Prima, Lungo l'Anseba e sull' altipiano abissino. Bergamo, Istituto Italiano d'Arti Grafiche, 1908. Size  $10\frac{1}{2} \times 7\frac{1}{2}$ , pp. 184. *Map and Illustrations.* Price 6 lire. *Presented by the Publishers.*
- French Congo.** *La G., B.S.G.* 17 (1908): 337-341. **Lenfant.**  
 Mission du haut Logone. Par le Commdt. Lenfant.
- German East Africa.** *Z. Ges. E. Berlin*, 1908: 251-265. **Jaeger.**  
 Vorläufiger Bericht über eine Forschungsreise in das abflusslose Gebiet Deutsch-Ost-Afrikas. Von Fritz Jaeger. *Map and Illustrations.*  
 Reference has been made from time to time in the *Journal* to the results of this journey (vol. 29, pp. 226-457; 30, p. 561).
- German East Africa.** **Mecklenburg-Schwerin.**  
*Deutsches Kolonialblatt* 19 (1908): 331-334, 429-433, 571-577.  
 Die zentralafrikanische Expedition S. H. des Herzogs Adolf Friedrich zu Mecklenburg-Schwerin.  
 See notes in the April number, p. 445, and July, p. 86.
- Morocco.** **Moore.**  
 The passing of Morocco. By Frederick Moore. London: Smith, Elder, & Co., 1908. Size  $7\frac{1}{2} \times 5$ , pp. xiv. and 190. *Map and Illustrations.* Price 5s. net. *Presented by the Publishers.* [See p. 177, ante.]

- Moreoco.** *B.S.R.G. Anvers* 31 (1907): 243-334. **Richet.**  
 Voyage aux dernières citadelles de l'Islam. Par Etienne Richet.
- Morocco.** *Renseignements Col., Afrique française* 18 (1908): 33-41. **Gentil.**  
 La mission Louis Gentil au Maroc (1907). Rapport au Comité du Maroc. Par Louis Gentil.  
 See note in the May number, p. 556.
- Morocco—Sebu.** *Renseignements Col., Com. Afrique française* (1907): 305-309. **Pobeguïn.**  
 Le fleuve Sebou dans sa plaine d'alluvions. Par E. Pobeguïn. *Sections and Diagrams.*
- Nigeria—Language.** **Charlton.**  
 A Hausa reading book, containing a collection of texts reproduced in facsimile from native manuscripts, arranged for the use of beginners and advanced students, with transliterations into Roman characters; translations, notes, etc. By Captain L. Charlton. London: H. Frowde, 1908. Size 7 x 4½, pp. 83 and 45. Price 4s. 6d. net. Presented by the Publisher.
- Nigeria—Northern.** **Dunstan.**  
 Northern Nigeria. Reports on the results of the Mineral Survey, 1904-5 and 1905-6. (Nos. ii. and iii. of series.) By Prof. Wyndham R. Dunstan. (Colonial Reports, Miscellaneous, Nos. 46 and 47, 1908.) Size 9½ x 6, pp. (No. 46) 26; (No. 47) 38. Prices 2d. and 2½d.
- Nigeria—Southern.**  
 Southern Nigeria: Report for 1906. (Colonial Reports, Annual, No. 554, 1908.) Size 9 x 6, pp. 94. *Diagrams.* Price 11d.
- North Africa.** *Ann. G.* 17 (1908): 34-55. **Chudeau.**  
 Etudes sur le Sahara et le Soudan. Par R. Chudeau. *Maps.*
- North Africa—Colonization.** *B.S.G. Com. Bordeaux* 31 (1908): 1-5, 21-31. **Valot.**  
 Le peuplement européen dans l'Afrique Mineure. Par Pierre Paul Valot.
- North Africa—Magnetism.** **Keeling.**  
 Egypt: Survey Department Paper No. 6. Magnetic observations in Egypt, 1895-1905, with a summary of previous magnetic work in Northern Africa. By B. F. E. Keeling. Cairo, 1907. Size 10½ x 7, pp. 66. *Maps and Diagrams.*
- Nyasaland.** **Dunstan.**  
 Nyasaland Protectorate. Report on the results of the mineral survey, 1906-7. By Prof. Wyndham R. Dunstan. (Colonial Reports, Miscellaneous, No. 48, 1908.) Size 9½ x 6, pp. 36. Price 2½d.
- Sahara.** *La G., B.S.G., Paris* 16 (1907): 361-384. **Niéger.**  
 Du Touat à Taodenni. Raid accompli sous le commandement du lieutenant-colonel Laperrine, mars-juillet, 1906. Par J. Niéger. *Map.*  
 Noticed in the April number, p. 444.
- Sahara.** **Martin.**  
 A la frontière du Maroc. Les Oasis Sahariennes (Gourara-Touat-Tidikelt). Par A. G. P. Martin. Tome I. Algiers: Imprimerie Algérienne, 1908. Size 10 x 6½, pp. 410. *Sketch-map and Illustrations.* Price 6.50 fr. Presented by the Publishers.
- Sahara—Geology.** *Renseignements Col., Com. Afrique française* (1907): 142-151. **Mussel.**  
 Observations géologiques faites au cours de la tournée du Lieut.-Colonel Laperrine du Touat à Taoudeni par Achourat. Par le Lieut. Mussel. *Sketch-map and Sections.*
- Tunis—Geology.** **Thomas.**  
 Essai d'une description géologique de la Tunisie, d'après les travaux de la Mission de l'Exploration Scientifique de 1884 à 1891, et ceux parus depuis. Par Philippe Thomas. 1<sup>re</sup> partie: Aperçu sur la géographie physique. Paris: Imprimerie Nationale, 1907. Size 10 x 6½, pp. xxxiii. and 218. *Maps and Illustrations.*
- West Africa.** **Güssfeldt and others.**  
 Die Loango-Expedition, ausgesandt von der Deutschen Gesellschaft zur Erforschung Äquatorial-Afrikas, 1873-1876. Ein Reisewerk von Paul Güssfeldt, Julius Falkenstein, und Eduard Pechuël-Loesche. Dritte Abteilung, Zweite Hälfte, von Dr. E. Pechuël-Loesche. Stuttgart: Strecker & Schröder, 1907. Size 11½ x 8, pp. viii. and 504. *Illustrations.* Price 20s.  
 This work is now completed, after a pause of twenty-five years.

**West Africa—Boundary.** *B. Comité Afrique française* 18 (1908): 50-52. ———

*Le traité franco-libérien. Map.*

See note in the *Journal* for January, 1908, p. 105.

#### NORTH AMERICA.

**Canada—British Columbia.** *J.R. Anthropological I.* 37 (1907): 306-374. **Hill-Tout.**

Report on the ethnology of the south-eastern tribes of Vancouver Island, British Columbia. By C. Hill-Tout.

**Canada—Labrador.**

**Hubbard.**

A woman's way through unknown Labrador: an account of the exploration of the Nascaupsee and George rivers. By Mrs. Leonidas Hubbard. London: J. Murray, 1908. Size 9 × 5½, pp. xvi. and 388. *Map, Portraits, and Illustrations.* Price 10s. 6d. net. Presented by the Publisher.

**Canada—Mackenzie River.** *B. American G.S.* 40 (1908): 157-169.

**Stefansson.**

On the Mackenzie River. By V. Stefansson. *Illustrations.*

Mr. Stefansson was the ethnologist of Mr. Mikkelsen's expedition.

**Canada—New Brunswick.** *B. Nat. Hist. S. New Brunswick* 6 (1908): 17-39. **Ganong.**

Notes on the natural history and physiography of New Brunswick. By W. F. Ganong. 107-112. *Maps.*

A continuation of an instructive series of notes.

**Canada—Nova Scotia.**

**Silver.**

Farm-cottage, camp, and canoe in maritime Canada; or, The call of Nova Scotia to the emigrant and sportsman. By Arthur P. Silver. London: G. Routledge & Sons, [1908]. Size 8½ × 6, pp. xviii. and 250. *Illustrations.* Price 6s. Presented by the Publishers.

**Canada—Place-names.**

Geographic Board of Canada. Decisions, December, 1907—February, 1908. (Extract from the *Canada Gazette*, February 29, 1908.) Ottawa, 1908. Size 10 × 6½, pp. 6.

**Canada—Quebec.**

**Soulsby.**

Catalogue of maps of Quebec. By Basil H. Soulsby. (Extract from part xli., British Museum Catalogue of Maps.) London, 1908. Size 11 × 8½, pp. [21].

This has a special interest in connection with the coming celebration. Such a number of map-titles has probably never before been brought together in the case of Quebec (both city and province), and the double system of indexing, by proper names and titles, is a valuable aid to reference.

**Canada—Rocky Mountains.** *B.G.S. Philadelphia* 6 (1908): 16-30.

**Schäffer.**

Among the sources of the Saskatchewan and Athabasca rivers. By Mary T. S. Schäffer. *Illustrations.*

On an exploring expedition carried out in 1907.

**Canada—Rocky Mountains.** *P.A.Nat. Sc. Philadelphia* 59 (1907): 560-563.

**Vaux.**

Observations made in 1907 on glaciers in Alberta and British Columbia. By George and William S. Vaux.

See note in the May number, p. 567.

**Mexico.**

**Lauterer.**

Mexico: das Land der blühenden Agave einst und jetzt. Nach eigener Anschauung und Quellenstudien geschildert von Dr. Joseph Lauterer. Leipzig: Otto Spamer, 1908. Size 9 × 6, pp. viii. and 360. *Illustrations.* Presented by the Publisher.

A useful general description of Mexico, in part from personal knowledge.

**Mexico—Chihuahua.**

**Griggs.**

Mines of Chihuahua: History, Geology, Statistics, and Mining Companies Directory by Jorge Griggs. (Chihuahua, 1907.) Size 9 × 6, pp. 350 and xii. *Maps, Plans, Sections, and Illustrations.* Presented by the Author.

**Mexico—Commercial.**

**Sapper.**

Wirtschaftsgeographie von Mexico. Von Prof. Dr. Karl Sapper. (Angewandte Geographie . . . Redaktion, Dr. Hugo Grothe.) Halle a. S., Gebauer-Schwet-schke, 1908. Size 8½ × 5½, pp. 116. Price 3.50m. Presented by the Publishers.

**United States—Oregon.****Clarke.**

Pioneer days of Oregon history. By S. A. Clarke. Two vols. Cleveland: A. H. Clark Co., 1905. Size  $9\frac{1}{2} \times 6$ , pp. x., iv., and 730. *Facsimile Map, Portraits, and Illustrations.* Price \$4.50.

**CENTRAL AND SOUTH AMERICA.****Andes.****Z. Gletscherkunde** 2 (1908): 271–284.**Sievers.**

Zur Vergleichsicherung der Cordilleren des tropischen Südamerika. Von Wilhelm Sievers. *Sketch-maps and Illustrations.*

**Chile.****Canto.**

Economical and social progress of the Republic of Chile. (By Julio Perez Canto.) Santiago de Chile, 1906. Size  $9\frac{1}{2} \times 6\frac{1}{2}$ , pp. 342. *Maps and Illustrations.* Presented for the Author.

**Colombia.**

Denouncement and allotment of public lands in the Republic of Colombia (South America): Official procedure and regulations. London, 1906. Size  $11 \times 8\frac{1}{2}$ , pp. 12. *Illustrations.*

Includes a report on Colombia by the Hon. J. Barrett, U.S. minister.

**Danish West Indies.** *G. Ts., Copenhagen* 19 (1907–08): 73–84.**Mortensen.**

Fra de dansk-vestindiske Øer. Af Dr. Th. Mortensen. *Map and Illustrations.*

**Dutch Guiana.** *Ts. K. Nederland. Aardr. Genoots.* 25 (1908): 94–112.**Bakhuis.**

De 5de wetenschappelijke expeditie naar het binnenland van Suriname. Door L. A. Bakhuis. *Map.*

**Ecuador—Andes.****Meyer.**

In the high Andes of Ecuador: Chimborazo, Cotopaxi, etc. By Prof. Hans Meyer. Portfolio of Plates. London: Williams & Norgate, 1908. Size  $13 \times 16$ , 24 pages and 43 plates. Price 75s. *Presented by the Publishers.* [To be reviewed.]

**Falkland Islands.****Andersson.**

Wissenschaftliche Ergebnisse der schwedischen Südpolar-Expedition, 1901–1903, unter Leitung von Dr. Otto Nordenfjöld. Band III., Lieferung 2. Contributions to the geology of the Falkland Islands. By J. G. Andersson. Stockholm, 1907. Size  $11 \times 8\frac{1}{2}$ , pp. 38. *Maps and Illustrations.*

**Peru—Historical.****Oviedo and Markham.**

A narrative of the vice-regal embassy to Vilcabamba, 1571, and of the execution of the Inca Tupac Amaru, Dec. 1571. By Friar Gabriel de Oviedo; translated by Sir Clements Markham. (Works issued by the Hakluyt Society, Series II., Supplement to vol. 23.) London, 1908. Size  $9 \times 6$ , pp. 397–412.

**Peru—Loreto.****Larrabure i Correa.**

Coleccion de leyes, decretos, resoluciones i otros documentos oficiales referentes al Departamento de Loreto, formada de orden suprema por el doctor Carlos Larrabure i Correa. Vols. 10–12. Lima, 1907. Size  $9\frac{1}{2} \times 6\frac{1}{2}$ , pp. (vol. 10) x. and 578; (vol. 11) viii. and 590; (vol. 12) iv. and 606.

Contains a good deal of information on exploring and prospecting expeditions.

**Peru—Meteorology.****Bailey.**

Peruvian meteorology: Observations made at the Arequipa station, 1892–1895. By Solon I. Bailey. (Annals of the Astronomical Observatory of Harvard College, vol. 48, part i.) Cambridge, Mass., 1907. Size  $12 \times 9\frac{1}{2}$ , pp. vi. and 104. *Diagrams.* Presented by the Director, Harvard College Observatory.

Tabularized results of an extensive series of observations made at Arequipa after the establishment of the Arequipa station of the observatory of Harvard college.

**South America—Amazon Basin.****Rosales.**

*B.S.G. Colombia; No. Extraordinario* (1907): 13–33.

Exploraciones de los hermanos Reyes en la hoya amazónica. Por José Miguel Rosales.

**St. Vincent and Martinique.** *P.R.S. Ser. A.* 80 (1908): 281–284.**Anderson.**

Report on the eruptions of the Soufrière in St. Vincent in 1902, and on a visit to Montagne Pelée in Martinique. Part II. The changes in the districts and the subsequent history of the Volcanoes. By Dr. Tempest Anderson. (Abstract.)

**Uruguay.**

Annario estadístico de la República Oriental del Uruguay: años 1904 à 1906. 2 vols. Montevideo, 1907-08. Size 12 x 8, pp. (vol. i.) xxviii. and 816; (vol. ii.) xxxvi. and 942. *Maps, Illustrations, and Diagrams.*

**Venezuela.****Fortoul.**

Historia constitucional de Venezuela. Por José Gil Fortoul. Tomo I. Berlin: C. Heymann, 1907. Size 9½ x 6½, pp. xii. and 570. *Presented by the Author.*

**West Indies—Meteorology.****Fischer.**

*Petermanns M., Ergänzungsheft 159 (1908): pp. 70.*

Die Hurricanes oder Drehstürme Westindiens. Von Dr. Alfred Fischer. *Sketch-maps and Diagrams.*

**AUSTRALASIA AND PACIFIC ISLANDS.****Australia.****Lang.**

Romance of Empire: Australia. By W. H. Lang. London: T. C. and E. C. Jack, [1908]. Size 8½ x 6, pp. xii. and 300. *Maps and Illustrations. Price 6s. net. Presented by the Publishers.*

**New Guinea.**

*Ts. K. Ned. Aardr. Genoots. 25 (1908): 304-307.*

**Weel.**

Een tocht op de Bensbach-rivier of Torasi, de grensrivier van zuid Nieuw-Guinea, in Dec. 1906. Door K. M. van Weel. *Map.*

**New Guinea—Historical.**

*Ts. K. Ned. Aardr. Genoots. 25 (1908): 308-347. Rouffaer.*

De Javaansche naam "Seran" van z. w. Nieuw-Guinea vóór 1545; en een Rapport van Rumphius over de kust van 1684. Door G. P. Rouffaer.

**Pacific Ocean.****Bryna.**

The Pacific Scientific Institution. An address by William Alanson Bryan. (Pacific Institution Publications, Special Series, No. 2.) Chicago, Ill., 1908. Size 9 x 6, pp. 16.

Explains the programme laid down for the scientific exploration of the Pacific (cf. *Journal*, March, 1908, p. 339).

**Queensland—Port Mackay.****Roth.**

The discovery and settlement of Port Mackay, Queensland. By H. Ling Roth. Halifax: F. King & Sons, 1908. Size 10 x 7½, pp. viii. and 114. *Maps, Plans, and Illustrations. Presented by the Author.*

By much careful research the author has succeeded in rescuing from oblivion an interesting chapter in the history of the early settlement of Australia.

**Victoria—Orography.****Hart.**

The Highlands and main divide of Western Victoria. By T. S. Hart. *Sketch-maps and Sections.*

See note in the July number, p. 90.

**POLAR REGIONS.****Antarctic—German Expedition.****Drygalski.**

Deutsche Südpolar-Expedition, 1901-1903. Im Auftrage des Reichsamtes des Innern herausgegeben von Erich von Drygalski. I. Bd., Heft 1; II. Bd., Heft 1; V. Bd., Heft 1; VI. Bd., Heft 1; VII. Bd., Heft 1; VIII. Bd., Heft 1; IX. Bd., Heft 1-6. Berlin: G. Reimer, 1905-1907. Size 13½ x 10½. *Maps, Illustrations, and Diagrams. Presented by the Imperial Ministry of the Interior, Germany.*

See review in the July number, pp. 27, 32.

**Antarctic—Swedish Expedition.****Nordenskiöld and others.**

Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition, 1901-1903, unter Leitung von Dr. Otto Nordenskiöld. Bd. III., Lief. 2, Contributions to the geology of the Falkland Islands, by J. G. Andersson (pp. 38); Lief. 3, Ueber die tertiäre Flora der Seymour-Insel, von P. Dusen (pp. 28); Bd. IV., Lief. 7, Bakteriologische Studien während der Schwedischen Südpolar-Expedition, 1901-1903, von Erik Ekelöf (pp. 120); Bd. V., Lief. 10, Die Pterobranchier der Schwedischen Südpolar-Expedition, 1901-1903, nebst Bemerkungen über *Rhabdopleura Normani* Allman, von K. A. Andersson (pp. 122); Lief. 11, The Acari of the Swedish South Polar Expedition, by Ivar Trägårdh (pp. 34); Bd. VI., Lief. 1, Die Gastropoden, von H. Stöbel (pp. 112); Lief. 2, Moosbewohner, von F. Richters (pp. 16). Stockholm, 1907-1908. Size 11 x 8½. *Maps and Illustrations.*

See review in the July number, p. 42.

**Arctic.****Holmes.**

The log of the *Laura* in Polar Seas. A hunting cruise from Tromsø, Norway, to Spitsbergen, the Polar ice off East Greenland, and the island of Jan Mayen in the summer of 1906. Kept by Bettie Fleischmann Holmes. Cambridge (Mass.), [privately printed], 1907. Size 11 × 7½, pp. 138. *Illustrations. Presented by the Author.* [See p. 177, ante.]

**Arctic Ocean.***An. Hydrographie* 36 (1908): 147-156.**Perlewitz.**

Zur Ozeanographie der nordeuropäischen Meere im Anschluss an Nansens "Northern Waters." Von P. Perlewitz. *Maps.*

**MATHEMATICAL GEOGRAPHY.****Cartography.****Daniels.**

A text-book of topographical drawing. By Frank T. Daniels. Boston: D. C. Heath & Co. (London: G. G. Harrap and Co.), 1907. Size 6 × 7½, pp. viii. and 144. *Illustrations and Diagrams. Price 6s. Presented by the Publishers.*

**Cartography.****Zöppritz.**

Leitfaden der Kartenentwurflehre für Studierende der Erdkunde und deren Lehrer, bearbeitet von Prof. Dr. Karl Zöppritz. In zweiter . . . Auflage herausgegeben von Dr. Alois Bludau. Zweiter Teil: Kartographie und Kartometrie. Leipzig: B. G. Teubner, 1908. Size 9½ × 6½, pp. viii. and 110. *Illustrations and Diagrams. Price 3.60m.*

**Cartography—Projections.** *U.S. Monthly Weather Rev.* 35 (1907): 559-564. **Abbe.**

Comprehensive maps and models of the globe for special meteorological studies. By Prof. Cleveland Abbe.

**Compass—Historical.****Forena.**

La questione su Flavio Gioia e la bussola al lume di nuovi documenti e di nuove allegazioni. Di Filippo Forena. Venice, 1908. Size 9½ × 6½, pp. 14.

**Geodesy—Congress.**

Comptes rendus des séances de la quinzième conférence générale de l'Association Géodésique Internationale, réunie à Budapest du 20 au 28 Septembre, 1906, rédigés par le Secrétaire perpétuel, H. G. van de Sande Bakhuyzen. 1<sup>er</sup> volume. Berlin, 1908. Size 11¼ × 9, pp. 404. *Maps and Illustrations.*

The papers and reports supply a comprehensive summary of recent geodetic progress.

**Navigation.****Dunraven.**

Self-instruction in the practice and theory of navigation. By the Earl of Dunraven. Revised and enlarged edition. 3 vols., with supplement. Extracts from the Nautical Almanac, 1898, and from the Admiralty Tide Tables, 1907. London: Macmillan & Co., 1908. Size 9 × 6. *Diagrams. Price 25s. 6d.*

This new edition of a well-known work has been revised and considerably extended.

**Reconnaissance.****Lewis.**

Panorama drawing from nature and from maps, with notes on drawing a contoured sketch from a panorama. By Captain P. E. Lewis. London: H. Rees, Ltd., 1908. Size 8½ × 5½, pp. 24. *Illustrations. Price 1s. 6d. net. Presented by the Author.*

**Surveying—Photographic.** *Archiv. Photogrammetrie* 1 (1908): 35-45.**Thiele.**

Métrophotographie aérienne à l'aide de mon Auto-Panoramographe. Par R. Thiele. *Illustrations and Diagrams.*

**PHYSICAL AND BIOLOGICAL GEOGRAPHY.****Climatology.****Halbfass.**

Klimatologische Probleme im Lichte moderner Seenforschung. Von Prof. Dr. W. Halbfass. Zweiter Teil. N.P., [1908]. Size 10 × 8, pp. 26. *Diagrams.*

**Coast Erosion.****Owens and Case.**

Coast erosion and foreshore protection. By John S. Owens and Gerald O. Case. London: St. Bride's Press, [1908]. Size 8½ × 5½, pp. 148. *Illustrations and Diagrams. Presented by the Authors.*

**Cosmogony.****Arrhenius.**

Worlds in the making: the evolution of the Universe. By Svante Arrhenius.

Translated by Dr. H. Borns. London, etc.: Harper & Bros., 1908. Size 8 × 5½, pp. xiv. and 280. *Maps and Illustrations. Price 5s. net. Presented by the Publishers.*

**Earth-movements.** *Geol. Mag.* V. 5 (1908): 206-209. Jamieson.

On changes of level and the production of raised beaches. By Dr. T. F. Jamieson.

Suggests that raised beaches may be a result of the diminished pressure of the land owing to denudation.

**Geomorphology.** Jaggard.

*B. Museum Comp. Zoology, Harvard Coll., Geol. Ser.* 8 (1908): 283-304.

Experiments illustrating erosion and sedimentation. By Thomas Augustus Jaggard. *Illustrations.*

**Geomorphology—Deposition.** *Sitzungsber. K. Preuss. A. W.* (1908): 48-57. Potonié.

Ueber rezente allochthone Humusbildungen. Von Prof. Dr. H. Potonié.

**Geophysics.** *Rep. British Ass., Leicester* 1907 (1908): 427-438. Love.

Section A: Mathematical and Physical Science. Address by the President, Prof. A. E. H. Love [on a dynamical theory of the shape of the Earth]. *Maps and Diagrams.* [See p. 154, ante.]

**Geophysics.** Love.

The figure and constitution of the Earth. By Prof. A. E. H. Love. London, 1908. Size 8½ × 5½, pp. 16. *Diagrams.* [See p. 154, ante.]

**Meteorology—Historical.** Gilbert.

Die meteorologischen Theorien des griechischen Altertums. Von Otto Gilbert. Leipzig: B. G. Teubner, 1907. Size 9 × 6, pp. vi. and 746. *Price 20m. Presented by the Publisher.*

**Oceanography—Deposits.** Collet.

Les dépôts marins. Par le Dr. Léon-W. Collet. (Encyclopédie scientifique: Bibliothèque d'Océanographie physique. Directeur, Dr. J. Richard.) Paris: O. Doin, 1908. Size 7½ × 4½, pp. 326. *Map and Illustrations. Price 5 fr. Presented by the Publisher.*

This appears to be a useful and up-to-date little handbook.

**Oceanography—North Sea.** Wheeler.

The North Sea: its physical characteristics, tides, currents, and fishery. By W. H. Wheeler. London: J. D. Potter, 1908. Size 8½ × 5½, pp. iv. and 42. *Maps. Price 2s. 6d. Presented by the Author.*

**Oceanography—North Sea.** *An. Hydrographie* 36 (1908): 116-124. Brennecke.

Stündliche Änderungen der hydrographischen und biologischen Verhältnisse auf der Reede von Ostende (6-8. September, 1906). Von Dr. W. Brennecke. *Diagrams.*

**Oceanography—Relief.** *Riv. G. Italiana* 15 (1908): 20-27. Ricchieri.

Per la terminologia dei fondi oceanici. Relazione del Prof. G. Ricchieri.

**Oceanography—Sea-water.** *Ymer* 27 (1907): 111-142. Pettersson.

Om hafsvattnets kemiska beständsdelar. Af Otto Pettersson. *Sketch-maps and Sections.*

**Oceanography—Voyage.** Brennecke.

*Verhandl. XVI. Deuts. G.-tages, Nürnberg* (1907): 37-43.

Ozeanographische Arbeiten S.M.S. Planet. Von Dr. W. Brennecke.

**Seismology.**

*Publications Earthquake Investigation Committee*, Nos. 23 and 24 (1907): pp. 16 and 274.

Report on the Great Indian Earthquake of 1905. Part i. Seismograms. Part ii. Seismographical observations. *Map, Diagrams, and Section.*

**Terrestrial Magnetism.** Bauer.

Department of terrestrial magnetism of the Carnegie Institution of Washington. Annual report of the director (L. A. Bauer), 1907. (Reprinted from Year Book, No. 6.) [Washington, 1908.] Size 10 × 7, pp. 154-166. *Map and Illustrations.*

Includes a report on the magnetic survey of the Pacific during 1907. (Cf. April number, p. 448.)

**Zoogeography—Elephants.**

A guide to the elephants (recent and fossil) exhibited in the Department of Geology and Paleontology in the British Museum (Natural History). London, 1908. Size 8½ × 5½, pp. iv. and 46. *Illustrations. Price 6d. Presented by the British Museum (Natural History).*

**Zoogeography—Fishes.**

Guide to the gallery of fishes in the Department of Zoology of the British Museum (Natural History). London, 1908. Size vi. and 210. *Illustrations. Price 1s. Presented by the British Museum (Natural History).*

**Zoogeography—Insects.**

British Museum (Natural History). Zoological Department, Insect Section. A guide to the exhibited series of insects. London, 1908. Size  $8\frac{1}{2} \times 5\frac{1}{2}$ , pp. 60. *Illustrations. Price 1s. Presented by the British Museum (Natural History).*

These carefully prepared guides will add greatly to the instructiveness of the exhibits.

**ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.****Anthropogeography.****Conder.**

The rise of man. By Colonel C. R. Conder. London: J. Murray, 1908. Size  $9 \times 5\frac{1}{2}$ , pp. viii. and 368. *Price 12s. net. Presented by the Publisher.*

**Anthropogeography. B. American G.S. 40 (1908): 65-81.****Semple.**

Geographical location as a factor in history. By Ellen Churchill Semple.

This is another chapter from Miss Semple's promised work (cf. *Journal*, vol. 31, p. 110).

**Anthropogeography—Population.****Tronnier.**

Beiträge zum Problem der Volksdichte. Von Richard Tronnier. Stuttgart: Strecker & Schröder, 1908. Size  $9\frac{1}{2} \times 7$ , pp. 88. *Price 2.80m. Presented by the Publishers.*

**Colonisation.****Leroy-Beaulieu.**

De la colonisation chez les peuples modernes. Par Paul Leroy-Beaulieu. 6<sup>e</sup> édition. 2 vols. Paris: F. Alcan, 1908. Size  $9 \times 5\frac{1}{2}$ , pp. (vol. 1) xxx. and 706; (vol. 2), 706. *Price 20 fr. Presented by the Author.*

**Commercial.****Hahn.**

Die Entstehung der wirtschaftlichen Arbeit. Von Dr. Ed. Hahn. Heidelberg: Carl Winter, 1908. Size  $8 \times 5$ , pp. iv. and 110. *Price 2.50m. Presented by the Publisher.*

**Commercial.****Halle.**

Die Weltwirtschaft; ein Jahr- und Lesebuch. Herausgegeben von E. von Halle. II. Jahrgang, 1907. Leipzig, etc.: B. G. Teubner, 1907. Size  $11 \times 7\frac{1}{2}$ , pp. vi., 368; viii., 284; vi. and 288. *Illustrations. Price 15m. Presented by the Publisher.*

The first volume was reviewed in vol. 30, p. 554.

**Economic—Tropical Agriculture.****Wildeman.**

Les plantes tropicales de grande culture. Par E. de Wildeman. Tome i. Caféier, cacaoyer, colatier, vanillier, bananiers. Brussels: A. Castaigne, 1908. Size  $11 \times 7$ , pp. viii. and 390. *Illustrations. Price 10 fr.*

The second volume will be devoted chiefly to rubber plants.

**Historical—Homer's Geography.****Della Seta.**

*Rendiconti R.A. Lincei* 16 (1907): 570-613.

Appunti di topografia omerica. Del dott. A. Della Seta.

**Historical—Mongols.****Curtin.**

The Mongols: a history. By Jeremiah Curtin. London: S. Low, Marston, & Co., 1908. Size  $9 \times 6$ , pp. xxvi. and 426. *Map and Portrait. Price 12s. 6d. net. Presented by the Publishers.*

**Political Geography.****Tourville.**

The growth of modern nations: a history of the particularist form of society. Translated from the French of Henri de Tourville. London: E. Arnold, 1907. Size  $9 \times 5\frac{1}{2}$ , pp. viii. and 508. *Price 12s. 6d. net.*

An admirable sketch of the main events and influences which have gone to the making of the chief nations of the present day.

## BIOGRAPHY.

## Humboldt.

## Hamy.

Correspondance d'Alexandre de Humboldt avec François Arago (1809-1853).  
Publiée . . . par le Dr. E.-T. Hamy. Paris: E. Guilmoto, [1908]. Size  $7\frac{1}{2} \times 4\frac{1}{2}$ ,  
pp. xvi. and 378. *Portrait.* Price 3.50 fr. *Presented by the Publisher.*

## Körösy.

*Abrégé B.S. Hongroise G. 36* (1908): 17-19.

## Thirring.

József v. Körösy. Von Dr. Gustav Thirring. (*Földrajzi Közlemények 36* (1908):  
41-49. *Portrait.*)

## Swedenborg.

## Nathorst.

Emanuel Swedenborg as a geologist. By A. G. Nathorst. (Emanuel Swedenborg  
as a scientist. Miscellaneous contributions edited by Alfred H. Stroh. Vol. 1,  
section 1.) Stockholm, 1908. Size  $10\frac{1}{2} \times 7\frac{1}{2}$ , pp. 48. *Facsimile Illustrations.*  
*Presented by the Author.*

## GENERAL.

## British Empire—Cotton.

## Dunstan.

British Cotton Cultivation. Reports on the quality of cotton grown in British  
possessions. By Prof. Wyndham Dunstan. (Colonial Reports, Miscellaneous,  
No. 50, 1908.) Size  $9\frac{1}{2} \times 6$ , pp. 46. Price 2½d.

## British Empire—Mines.

## Stokes.

Mines and minerals of the British Empire. Being a description of the historical,  
physical, and industrial features of the principal centres of mineral production in  
the British Dominions beyond the seas. By Ralph S. G. Stokes. London: E.  
Arnold, 1908. Size  $9 \times 5\frac{1}{2}$ , pp. xx. and 404. *Illustrations.* Price 15s. net. *Pre-*  
*sented by the Publisher.*

## Catalogue.

British Museum. Catalogue of maps. Accessions, Part xli., March, 1908. London,  
1908. Size  $11\frac{1}{4} \times 9$ , 203 ll. *Presented by the Superintendent, Map Department,*  
*British Museum.*

## Educational—History.

## Jäger.

The teaching of history. By Dr. Oskar Jäger. Translated by H. J. Chaytor,  
with an introduction by C. H. Firth. Oxford: B. H. Blackwell, 1908. Size  
 $7\frac{1}{4} \times 5$ , pp. xxiv. and 228. Price 3s. 6d. net. *Presented by the Publisher.*

Valuable from the point of view of the geographer for the full recognition shown  
by the author of the importance of keeping in view the relations of history to  
geography.

## Educational—Text-book.

## Heaton.

A scientific geography. Book I., The World. By Ellis W. Heaton. London:  
Ralph, Holland, & Co., 1908. Size  $7\frac{1}{4} \times 5$ , pp. 306. *Maps and Diagrams.* Price  
2s. 6d. net. *Presented by the Publishers.*

## German Colonies.

Die Deutsche Kolonialgesellschaft, 1882—1907. Im Auftrage des Ausschusses der  
Deutschen Kolonialgesellschaft dargestellt. Berlin: D. Reimer, 1908. Size  
 $10 \times 8$ , pp. vi. and 230. Price 2m. *Presented by the Publisher.*

A useful sketch of the activities of this energetic Society, and of the events which  
led up to its foundation, supplying to a large extent an outline of German Colonial  
enterprise in general.

## International Congress.

Livret des excursions scientifiques. Neuvième Congrès International de Géographie,  
Genève, 27 Juillet—6 Août, 1908. Geneva, 1908. Size  $9 \times 6$ , pp. 152. *Sections and*  
*Illustrations.*

## Journal Index.

Inhaltsverzeichnis von Petermanns Geographischen Mitteilungen, 1895-1904.  
Gotha: J. Perthes, 1907. Size  $11 \times 9$ , pp. iv. and 160. *Index-maps.* Price 10m.

## Medical Geography.

Report of the Advisory Committee for the Tropical Diseases Research Fund for the  
year 1907. London, 1908. Size  $13 \times 8\frac{1}{2}$ , pp. 158. *Map.* Price 1s. 11d.

## Natural Regions.

*Norske G.S. Aarbog 18* (1906-07): 33-54.

## Skattum.

Verdensdelenes geografiske individualitet. Af Dr. O. J. Skattum.

**Paradox.****Robertson.**

Modern geography and the Copernican hypothesis. By Dr. C. Robertson. Stirling: E. Mackay, 1908. Size 9 × 6, pp. x. and 92. *Diagrams and Illustrations.* Price 1s. *Presented by the Publishers.*

Another of the strange attempts to prove that existing astronomical science is entirely based on error. The author somewhat naïvely concludes that because scientists have not taken his former book seriously enough to refute its fallacies, therefore they are incontrovertible.

**Year-book.****Wagner.**

Geographisches Jahrbuch. XXX. Band, 1907, . . . herausgegeben von Hermann Wagner. Gotha: J. Perthes, 1907. Size 9 × 6, pp. xvi. and 398. Price 15m.

Deals with recent work in geophysics, hydrology, and the history of geography, as well as in the regional geography of Africa, Australasia, and Central and South America.

**NEW MAPS.**By **E. A. REEVES**, *Map Curator, R.G.S.***EUROPE.****British Isles—England and Wales.****Bartholomew.**

Plans of: Bournemouth. Scale 1:19,200 or 3·3 inches to 1 stat. mile.—Eastbourne. Scale 1:10,560 or 6 inches to 1 stat. mile.—Harrogate. Scale 1:10,560 or 6 inches to 1 stat. mile.—Newcastle and Gateshead. Scale 1:15,840 or 4 inches to 1 stat. mile. Edinburgh: John Bartholomew & Co., [1908]. *Price, mounted on cloth, 1s. each net. Presented by the Publisher.*

**British Isles—England and Wales.****Ordnance Survey.**

Sheets published by the Director-General of the Ordnance Survey, Southampton, from May 1 to June 30, 1908.

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Cornwall (First Revision), 58 s.w., 64 s.e., 65 n.e., 71 s.w., 84 (n.w. and s.w.). Kent (Second Revision), 14 s.w., 22 s.e., 23 s.e., 24 n.w., n.e., 25 n.w., 35 s.e., 36 n.e., s.w., 37 s.w., s.e., 45 n.w., n.e., s.w., 46 s.w., 47 n.w., s.w., 55 n.w., s.w., 56 n.w., 65 s.e., 67 n.e., s.e., 68 n.w., 73 n.e., 74 n.w., s.e., 75 n.w., 82 n.w., s.w., 84 n.e., 86 (n.e. and s.e.). Lancashire (First Revision of 1891 Survey), 101 s.e., 102 n.w., 107 s.w., s.e., 111 n.w., 114 s.w., 115 n.w. Lincolnshire (First Revision), 6 s.e., 7 n.e. Pembrokeshire (First Revision), 4 s.e., 5 s.w., 8 n.e., 9 n.e., 14 s.e., 21 n.w. Yorkshire (First Revision of 1891 Survey), 220 s.w., 235 n.w., n.e., 238a s.w., 246 s.w. *1s. each.*

25-inch—County Maps:—

Hampshire (Second Revision), XC. 1; XCIII. 3, 4, 11, 12, (14 and 13); XCIV. 2, 3, 5, 7, 10, 11, 12, 13, 14, 15; XCV. 7, 13, 14, 15; XCVII. 1, 3, 6, 7, 8; XCVIII. 2, 3, 5, 6, 7, 9, 10. Kent (Second Revision), IV. 9, 10, 11, 12; V. 9, 10, 14, 15, 16; XII. 2, 3, 4; XIII. 1; XLII. 14; XLIII. 7; LXX. 7, 14, 15, 16; LXXI. 9, 13; LXXVIII. 3, 4, 6, 7, 11, 12, (16 and 15); LXXIX. 1, 5, 10, 13; LXXX. 5. *3s. each.* LXXVIII. 1, 10. *1s. 6d. each.* Lancashire (First Revision of 1891 Survey), XCII. 14, 15, 16; C. 6; CI. 3, 5; CIV. 10; CVI. 12, 15; CXIII. 3, 4 (First Revision). Pembrokeshire (First Revision), XXVI. 16; XXXVIII. 7, 11, 16; XLII. 3 (XLII. 11 and part of XLII. 15); XLIII. 1, 9, 13. Yorkshire (First Revision of 1891 Survey), CCIV. 8, 9, 10; CCVI. 1, 11, 12, 16; CCXV. 3, 4; CCXVI. 3, 12; CCXVII. 5; CCXVIII. 7, 8, 11, 12, 13, 14; CCXIX. 1, 5, 9, 13; CCXXXI. 4; CCXXXIII. 1, 3. *3s. each.*

*E. Stanford, London Agent.*

**British Isles—England and Wales.****Shawe**

Phillips' new map of England and Wales. Compiled from the Ordnance Survey, showing Canals, Navigable Rivers, and Principal Railway Lines. By W. Shawe, F.R.G.S. Scale 1:633,600 or 1 inch to 10 stat. miles. London: George Philip & Son, [1908]. Price 10s. Presented by the Publisher.

An outline map, without hills, showing canals and navigable rivers. Canals in the hands of railway companies are distinguished by the style of the lettering of their names, by which means also the relative importance of towns, according to population, is also shown. Navigable canals and sections of rivers open to navigation are presumably indicated by a blue tint, although there is no note stating that this is so.

**England and Wales.****Geological Survey.**

6-inch Maps—Uncoloured. Cornwall, LXIII. N.W., N.E., S.W., S.E. 1s. 6d. each.

E. Stanford, London Agent.

**Europe—Central.****K. Preuss. Landesaufnahme.**

Uebersichtskarte von Mitteleuropa. Herausgegeben von der Kartogr. Abteilung der Kgl. Preuss. Landesaufnahme. Scale 1:300,000 or 1 inch to 4.7 stat. miles. Sheets: Aarhus, Apenrade, Göteborg. Berlin: K. Preuss. Landesaufnahme, 1907. Price 1.50 M. each sheet.

**Germany.****K. Preuss. Landesaufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartogr. Abteilung der Kgl. Preuss. Landesaufnahme. Scale 1:100,000 or 1 inch to 1.6 stat. miles. Sheets: 318, Zossen; 319, Beeskow; 341, Jüterbog. Berlin: K. Preuss. Landesaufnahme, 1908. Price 1.50 M. each sheet.

**Sweden.****Lönborg.**

Swedish maps. Edited by Dr. Sven Lönborg. First series. Stockholm, 1907. Presented by the Royal University, Uppsala.

This is the first series of facsimile maps of Sweden which Dr. Sven Lönborg originally intended to publish in 1903 with his work 'The Map of Sweden,' but from unavoidable causes he found it impossible to carry out his proposal until the present time. The text relating to the maps has therefore been in existence for some years, and to this work, and the various interesting papers by Dr. Lönborg on the early cartography of Sweden in *Ymer* and *Petermanns Mitteilungen* that have appeared in recent years, those interested in the history and critical consideration of the maps contained in this atlas are referred. In this first series of facsimiles there are altogether fifteen maps, reproduced by photography with evident care and skill, and if some of them are not so clear as might be desired, this is owing to the condition of the originals rather than to the method of reproduction. The expense connected with the preparation and publication of these maps has been generously met by a grant from the Kgl. Ecclesiastikdepartement for the publication of scientific works. The second issue of these facsimile maps will be accompanied by descriptive letterpress. The following is a list of the maps contained in this part:—

I. Part of Lappmarken of about A.D. 1600, showing the basins of the rivers Kemi, Torne, Kalix, Alten, and Pasvig. From the original in the Riksarkivet, Stockholm.—II. "Lapponiæ, Bothniæ, Ojaniæque Regni Sveciæ Provinciarum Septentrionalium Nova Delineatio," by Andreas Bureus, printed 1611. Reproduced in the size of the original from a copy in the Kgl. Biblioteket, Stockholm.—III. "Nativus Sueciæ Adiacentiumque Regnorum Typus," by Adrianus Veno Aurelius. Amsterdam, printed 1613. Reproduced in the size of the original from the copy in the Kgl. Biblioteket, Stockholm.—IV. Map of Södermanland by Crail von Bemebergh, 1625. Reproduced in the size of the original from a manuscript in the Kgl. Biblioteket, Stockholm.—V. The right-hand lower sheet of Andreas Bureus' "Orbis Arctoi Nova et Accurata Delineatio." Stockholm, printed 1626, in six sheets. Reproduced from the old copperplate preserved in the Statens Historiska Museum, Stockholm.—VI. and VII. "Orbis Arctoi Nova et Accurata Delineatio Auctore Andrea Bureo Sueco," [no date]. Printed in Amsterdam, 1635. New edition of No. V. Reproduced on the scale of the original from a copy in the Kgl. Biblioteket, Stockholm.—VIII. Nautical chart of the Baltic sea, by Johan Månsson. Printed in Stockholm [date unknown], and dedicated to Queen Christine. Reduced reproduction of a copy in the University Library of Uppsala.—IX. Lands and Estates of the village Borlänge in the parish of Tuna, Dalecarlia, by Jonas Arvidsson Kjellander, between 1640 and 1650. Reduced reproduction from the original in the archives of the Generallandtmäterikontoret, Stockholm.—X. District of Hölbo in Södermanland, by Anders Anderson, 1679. Reproduced

in five-sevenths of the size of the original in the archives of the Generallandtmäterikontoret, Stockholm.—XI. District of Örebro in Närke, by Gabriel Thoring. Reduced reproduction from the original in the archives of the Generallandtmäterikontoret, Stockholm.—XII. Principality of Östergötland, by Johan de Rogier, 1676. Reduced reproduction from the original in the University Library of Uppsala.—XIII. Västergötland, Dalsland, Halland, and Bohuslän, by Kjettil Classon Felterus, 1689. Reduced reproduction of the original in Generallandtmäterikontoret, Stockholm.—XIV. and XV. Sweden, 1688, based on the preceding geographical work, prepared in the Generallandtmäterikontoret, under the direction of Carl Gripenhjelms. Reproduced on same scale as the original in the Kgl. Biblioteket, Stockholm.

### ASIA.

#### Turkey in Asia.

Auler.

Die Hedschas-Bahn zwischen den Stationen Ma'an und El'Ula. Scale 1:750,000 or 1 inch to 11·8 stat. miles. *Petermanns Mitteilungen*, Ergänzungsheft, No. 161. Gotha: Justus Perthes, 1908. *Presented by the Publisher.*

### AFRICA.

#### Abyssinia.

Mylius and Bieber.

Kaffa. Routen der Expeditionen des Freiherrn Alphons v. Mylius, 1905. Aufgenommen von Friedrich J. Bieber. Scale 1:250,000 or 1 inch to 3·9 stat. miles. *Petermanns Mitteilungen*, Jahrgang 1908, Tafel 10. Gotha: Justus Perthes, 1908. *Presented by the Publisher.*

A continuation of the map noticed in the *Geographical Journal* for March last. It is prepared from the route surveys of F. J. Bieber, and accompanies the article on this part of the expedition in *Petermanns Mitteilungen* for May last.

#### Algeria.

Jonnart.

Département d'Oran. Carte des Voies de Communication dressée par ordre de M. C. Jonnart, Gouverneur-Général. Scale 1:400,000 or 1 inch to 6·3 stat. miles. Algiers: Gouvernement Général de Algérie, 1908. *Presented by M. René de Flotte de Roquevairre, Chef du Service des Cartes et Plans, Gouvernement Général de l'Algérie.*

A coloured sketch-map in outline, without hills, giving up-to-date information concerning railways and roads in the department of Oran.

#### Egypt.

Survey Department, Cairo

Topographical map of Egypt. Scale 1:10,000 or 6·3 inches to 1 stat. mile. Awan Province. Sheets: s.e. 140-38, 141-38, 143-38, 143-39, 144-39, 145-37, 38, 146-38. Qalubia Province. Sheets: n.e. 11-5. Cairo: Survey Department, 1908. *Presented by the Director-General, Survey Department, Cairo.*

#### Gold Coast.

Guggisberg.

Map of the Gold Coast. Published by the authority of Sir John Pickersgill Rodger, K.C.M.G., Governor, under the direction of Major F. G. Guggisberg, R.E., F.R.G.S., Director of Surveys, Gold Coast. Scale 1:125,000 or 1 inch to 1·9 stat. miles. Sheets: 72-J-I. Aluakru; 72-J-II. Adcembra; 72-P-II. Asankrangwa; 72-V-II. Axim; 73-H-III. Denu. Edinburgh and London: W. & A. K. Johnston, Ltd., 1908. *Price 2s. each sheet. Presented by Major F. G. Guggisberg, R.E., Director of Surveys, Gold Coast.*

#### Morocco.

Roquevairre.

Maroc. Carte dressée et dessinée par R. de Flotte de Roquevairre. Scale: 1:1,000,000 or 1 inch to 15·8 stat. miles. 4 sheets. Paris: Henry Barrère, 1908.

A new edition of a coloured map of Morocco, which appeared first in 1904. The results of recent route surveys by French officers and others seem to have been taken advantage of, and, for its scale, the map contains a considerable amount of detail. Plans of the following places appear as insets on enlarged scales: Marrakeah, Mazagan, Casa Blanca, Tangier, Safi, Larache, Rabat, El-Osar el-Kebir, Oujda, Meknes, Fez, environs of Fez, Figuig, Tarudant, Mogador, Agadir Irir.

#### Southern Nigeria.

Survey Department, Lagos.

Map of the Western Province of the Colony and Protectorate of Southern Nigeria. Compiled at the Survey Department, Lagos, 1908. Scale 1:250,000 or 1 inch to 3·9 stat. miles. Sheets: 61-W and 78-K. London: Topographical Section,

General Staff, War Office, 1908. *Price 6d. each sheet. Presented by the Director of Military Operations.*

Two sheets of the new map of Southern Nigeria noticed in the *Geographical Journal* for June, 1908. Like those already published, they are only preliminary issues to meet the demand pending the preparation of the more complete map.

### AMERICA.

#### Canada.

Department of Militia and Defence, Ottawa.

Topographic map of Canada. Scale 1:63,360 or 1 inch to 1 stat. mile. Ontario. Sheets: 8, Merrickville; 9, Morrisburg; 10, Brookville; 11, Mallorytown. Ottawa: Intelligence Branch, Department of Militia and Defence. London: Topographical Section, General Staff, War Office, 1908. *Presented by the Director of Military Operations.*

These are sheets in continuation of the topographical map of Ontario noticed in the *Geographical Journal* for July, 1907. Each sheet includes 15' of latitude and 30' of longitude, with the exception of the Mallorytown sheet, which only covers 15' of longitude. Contour-lines in brown are given at 25-foot intervals. Much useful information is given by means of symbols, and the sheets are clearly drawn and printed in colours.

#### Chile.

Oficina de Limites, Santiago.

Comision Chilena de Limites. Scale 1:250,000 or 1 inch to 2.9 stat. miles. Sheets: Linares—Nuble; Bio-Bio—Cautin. Santiago: Oficina de Limites, [1908]. *Presented by the Oficina de Limites, Santiago.*

### CHARTS.

#### Denmark.

Kgl. Søkort-Archiv, Copenhagen.

Kort udgivet af det Kongelige Søkort-Arkiv. Nos.: 219, Dansk Vestindien, St. Croix, Christianssted Havn; 220, Store Bølt, Nordlige Blad; 222, Islands Sydkyst, Vestmannaeyjar. Copenhagen: Kongelige Søkort-Arkiv, 1907-08. *Presented by the Danish Admiralty.*

#### England—Liverpool Bay.

Belam.

Liverpool Bay. Surveyed by the Marine Surveyor of the Mersey Docks and Harbour Board. Scale 1:36,000 or 1.8 inch to 1 stat. mile. Liverpool: Mersey Docks and Harbour Board, 1907. *Presented by H. G. G. Ashton, Esq., Assistant Marine Surveyor, Mersey Docks and Harbour Board.*

#### Indian Ocean and Red Sea.

Meteorological Office.

Monthly meteorological charts of the Indian Ocean north of 15° S. lat. and Red Sea, July, 1908. London: Meteorological Office, 1908. *Price 6d. each. Presented by the Meteorological Office.*

#### North Atlantic and Mediterranean.

Meteorological Office.

Monthly meteorological charts of the North Atlantic and Mediterranean, July, 1908. London: Meteorological Office, 1908. *Price 6d. each. Presented by the Meteorological Office.*

#### North Pacific.

U.S. Hydrographic Office.

Pilot chart of the North Pacific Ocean, July, 1908. Washington: U.S. Hydrographic Office, 1908. *Presented by the U.S. Hydrographic Office.*

### PHOTOGRAPHS.

#### British North Borneo.

Lomas.

Forty-two photographs of British North Borneo, taken by H. M. Lomas, Esq. *Presented by H. M. Lomas, Esq.*

The district in which these views were taken extends for about 50 miles east of Brunei bay, to the south-east of Labuan. Amongst them are some excellent characteristic views of scenery and natives.

(1) Weston, Brunei houses; (2) Brunei people; (3) Brunei houses; (4) Tabau village, Tambunan plains; (5) View from Tabau; (6) Liawan river; (7) Kerbau; (8) Tambunan plains; (9) Tall cocoanut palms, Tambunan plains; (10) Jungle on way from Tambunan; (11) Ranau Dusuns; (12-14) Dusun people, Tambunan plains; (15) Dusun girls; (16) Dusun bringing down bamboos for house building; (17) Dusun grave; (18) Paddy fields, Tambunan plains; (19) Planting paddy; (20) Winoowing

paddy; (21) On the Makatai hills; (22) Kaningow plains; (23) Small growth, Kaningow plains; (24) Paddy, Kaningow plains; (25) Tempassuk plains; (26) Tempassuk river from Kotabelud; (27) Jesselton; (28) Making the railway, 1903, at Penotal gorge; (29) Timber across Padas river, Penotal gorge; (30) Up Penotal gorge among the big trees; (31) River Padas at Tenom, the gates of the Penotal gorge; (32) Jungle-cleared track up towards Kaningow; (33 and 34) Forest and mountains between Tambunan and Kaningow; (35) Camp life; (36) Kaningow Muruts; (37) Muruts at Tenom preparing to dance; (38) Muruts dancing, Tenom; (39) Murut chiefs and warriors, Kaningow; (40 and 41) Kaningow and Dalit Muruts; (42) Chinese gambling-house, Sandakan.

#### Persia.

Bailward.

One hundred and seven photographs of Persia, taken by Colonel A. C. Bailward.

*Presented by Colonel A. C. Bailward.*

A very interesting set of photographs of the part of Persia bordering on the Caspian sea, extending from Resht to Teheran and Astrabad. Some good views of mountain scenery in the Elburs range are included.

(1 and 2) A Mazanderan village; (3) Bazar at Sari; (4) Camp in Mazanderan; (5 and 6) A Mazanderan house; (7) Loading up; (8) On the march, Mazanderan; (9-11) A wayside coffee house, Mazanderan; (12) Loading up at Larim; (13) House at Larim; (14) Near Naisarabad; (15-17) The South Caspian Coast district; (18 and 19) A cocoon shed; (20) Cotton factory, Farahabad; (21) Footbridge, Sarkh Rud; (22) The quay at Meshed-i-Sar; (23) Boat used for coasting trade, Meshed-i-Sar; (24) River-side at Meshed-i-Sar; (25) Church near Meshed-i-Sar; (26) Hoar frost at Chalan Darra; (27) The South Caspian shore; (28) Bridge at Chalan Darra; (29) Demavend from the south; (30) Village on lower slopes of Demavend; (31) Curious caves near Ab-i-Garun; (32) Mian Kaleh; (33 and 34) Interior of Mian Kaleh; (35) Gate of Mian Kaleh Fort; (36) Persian Artillery at Mian Kaleh; (37 and 38) Gate of Mian Kaleh; (39) Astrabad bay; (40) Road from Gez to Astrabad; (41-43) The Peri Bazar creek, near Resht; (44) Boat on Peri Bazar Creek; (45) Landing-place, Peri Bazar; (46) Mulberry plantations near Resht; (47) Fish trap, Mehmedabad; (48) Serai Mehmedabad and remains of Amol railway; (49) Village of Karatepe, Astrabad Bay; (50) Camp at Balajadeh; (51) Balajadeh, near Astrabad; (52) Shrine, Astrabad-Sari road; (53) At Enzeli; (54) Near Enzeli; (55) Shore at Enzeli; (56) Royal Pavilion and landing-stage, Enzeli; (57) Tower in Enzeli; (58-64) Lower valley of the Safed Rud; (65) The Teheran-Resht road; (66) Changing horses, Teheran Resht road; (67) Rest house, Teheran-Resht road; (68) Mosque near Barfarash; (69) Village in Nur valley; (70) Near Reina; (71) At Reina; (72) Elburz, near Reina; (73) An Elburz valley; (74) An Elburz village, Amol-Teheran road; (75) An Elburz village, north of Teheran; (76) An Elburz village; (77 and 78) High valley, Elburz mountains; (79) An Elburz shepherd; (80) Gorge in the Elburz, Amol-Teheran road; (81) Frost and snow at Baladeh, Nur valley; (82) Nur valley; (83 and 100) Imanzada-Hosain pass, Elburz mountains; (84-86) From top of Kenderan pass; (87) Near Shiristanek; (88-92) On the Amol-Teheran road; (93) Bridge on Amol-Teheran road; (94) Bas-relief Nasraddin Shah; (95) The Amol Teheran road; (96 and 97) A gorge, Amol-Teheran road; (98) Harhaz valley, near Amol; (99) Aliabad, Amol-Teheran road; (101 and 102) Imanzada Hosain; (103) Rest house, Teheran-Resht road; (104) Outskirts of Teheran; (105) A gate of Teheran; (106) British Legation, Teheran; (107) Rest house at Kudum, near Resht.

#### Uganda.

Hall.

Five photographs of the Murchison falls and Fola rapids, Uganda, taken by Captain C. R. Hall, Royal Munster Fusiliers. *Presented by Captain C. R. Hall.*

The Murchison falls and Fola rapids are on the White Nile, immediately after the river leaves Victoria Nyanza. These are striking views and good specimens of photography.

(1) The Fola rapids, looking up-stream; (2) The Fola rapids, looking across stream; (3) The Fola rapids, looking down-stream towards Rejaf; (4) The Murchison falls; (5) The ferry below the Murchison falls.

**N.B.**—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.









# The Geographical Journal.

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VOL. XXXII.

## BALKAN GEOGRAPHY AND BALKAN RAILWAYS.\*

By NOEL BUXTON.

THE reason for public attention to the Balkans to-day takes its origin so exclusively in diplomatic events, that I must urgently beg you to remember that the studies of the Geographical Society are purely non-political. To so many of you the very name of the Balkan conjures up the picture of meetings, dispatches, and mobilizing troops, that I must urgently protest: Cannot we for once be interested in the Balkans as a subject for dispassionate inquiry and pure delight in the extraordinary interest of its natural features? I, at all events, am so anxious not to offend that I confine myself strictly to the printed hints furnished for the guidance of speakers in selecting their proper subjects for study. The name of this paper is, therefore, not "Turkey in Europe"—a name which suggests a kind of political Earl's Court, a sort of Venice in London of a contentious character. Its name is "Balkan Geography," for "Balkan" is a purely geographical term. I remember a villager pointing out the way, saying, "Beyond that thick wood it is 'balkan,'" i.e. stony hills. Is it not a relief that for once to-night the name may bring to our minds, not a committee, but only this thought: that beyond the thick wood of politics there is a world of Balkan mountains to be enjoyed?

The Balkan peninsula, once the centre of civilization, is now largely a *terra incognita*. Though numberless Europeans constantly travel through it, very few of them leave the railway. It would be absurd to give the route of the traveller, or to speak of exploring expeditions, in a country so near home. Yet, so little are parts of it traversed, that

\* Read at the Royal Geographical Society, May 11, 1908. Map, p. 328.  
No. III.—SEPTEMBER, 1908.]

for many districts there are no accurate maps, as the traveller learns to his discomfiture when he has relied on maps to guide him. Although it is only three days away from London, or perhaps *because* of its nearness, the mountains of Africa are more often climbed than those of Albania.

No part of this still unknown land has lately been described at the meetings of the Geographical Society, except the single range of the Rhodope. For this reason, I must attempt to cover an unduly extensive field, and cannot hope to deal with it in more than a hasty manner, unless I run the risk of finding at the end that I have omitted my most interesting observations. But these are what I should most certainly include, and for this reason, I shall do best to hurry quickly to the most curious samples of Balkan geography. A geographical audience will easily fill in the obvious categories into which these samples fall. Thus can I hope best to throw light upon the three fields to which the Geographical Society directs your attention—geographical conditions, their influence on humanity, and their effect on human enterprise.

The Balkan peninsula is the most irregular of the three prongs which Europe throws out into the southern sea. Above all other qualities it is mountainous, but in particular it is a mountain chaos. Joined to Europe by a broad base, it is yet almost divided from Europe by the greatest river of the west. It is a confused extension of both the Alps and the Carpathians. Its ranges run both north to south and west to east. While the Alps become the Pindus, and run a more or less normal course southward into Greece, the Carpathians, apparently unaffected by the geological movements which created their neighbours, turn southwards when they have dipped underneath the Danube, and then, like a snake, wind eastwards again to the Black sea. The two ranges form a ganglion before they part, and then, in the angle between them, the most beautiful range of the peninsula, including the Rilo and the Rhodope, drifts towards the south-east.

Limestone is everywhere, except at the great heights, where granite appears. In these few instances, summits such as Rilo, the peerless Olympus, Musala in the Rhodope, Lubotim or "the Lovely Thorn" in the Shar, probably attain to 9000 feet. But, paradoxically enough, their heights are not yet ascertained.

It would be idle to enlarge further on the mountain formations, when they have been dealt with by Mr. Hogarth. I need only recall to you the brilliant description in his book, 'The Nearer East,' of the country and its effect on the inhabitants.

The rivers are even more capricious. Though the neck of the peninsula is so wide, yet the rain which falls on the Dinaric Alps within a few hours of the Adriatic is shouldered away by the narrow neck of mountains and directed right across the peninsula to the Black sea, so

that though its base is by far wider than that of either Italy or Spain, the Balkan is almost wholly severed from Europe by a line of water. Not content with this irregularity of formation, other rivers make confusion worse confounded by cutting through the ranges which might have been expected to turn the flow of water in an opposite direction. Thus the Isker, which at Sofia appears to be debarred from the Danube by the most definite wall of mountains imaginable, pierces straight through the Old Balkan, as it is called, and flows to the north instead of the east. Quite close by, the Struma, which would appear destined for the Black sea, bores through the Rilo range and makes a most unexpectedly economic route to the Egean. The Drin accomplishes an



A BALKAN LAKE.

even more remarkable feat in severing the whole enormous backbone of the Pindus, and connects, against all possible expectations, the centre of the peninsula with the Adriatic. The great Maritsa, which drains Eastern Roumelia, makes another unlikely turn, and, again to the advantage of future commerce, chooses the open Egean in preference to the closed waters of the Black sea. Strangest of all, the Danube, which is on one side a Balkan stream, penetrates the otherwise unconquered mass of the Carpathians at the famous Iron Gates.

It follows that one of the remarkable features of the Balkans is the prevalence of the Turkish name "Demirkapu," or gate of iron, a fair sample of which, on a small scale, may be seen between Belgrade and Nish from the luxurious carriages of the Orient express.

It is natural in such a geological confusion that the land should not be without lakes. Of all the scenic attractions which, in no distant future, will make the Balkans a new and more fashionable Switzerland, its lakes will probably be the most popular. Certainly, to-day there does not exist in Europe anything more picturesque than the lake of Ochrida, where all that is attractive in a crowded town by the Riviera is combined with the contrast of the isolated peak above the lake, crowned with mediæval fortresses, and the plain in which it stands, the wooded hills beyond the plain, and the interminable ranges of the Albanian mountains showing purple behind the lake.

It is not surprising, in view of this confusion of features, that the climate also is distinguished for variety. Included in the peninsula we have the balmy Riviera of the north-west, and a winter of Russian rigour in the east, while tropical violence of heat is met with in the south.

There is something entirely its own, also, in the astonishing contrasts of scenery in the Balkan. At times it is perfectly European. In Bosnia, Morihovo, or Rhodope, it is Alpine, with pines and meadows where the mountains above them are of sufficient height. In other districts of Bosnia, and again in parts of the Rhodope, it is absolutely English, and you might imagine yourself in some magnified Haslemere district of Surrey, with a great profusion of pines and bracken. But the typical impression of the commonest form of Balkan country is one of rather arid hills, often of a nakedness like those of Greece, with few trees, but a great prevalence of low scrub, usually oak or beech. Next below these you have the prevailing cultivated land, whose distinctive features are the apparent coarseness of the soil, and the absence of hedges or trees except where the land is dotted with oaks. These are usually lopped close to the trunk to their full height, so as to look like an inferior Lombardy poplar, or else pollarded at 10 or 12 feet, and employed for stacking hay. It is markedly a brown country, and appears more arid than it really is, for it undulates in such a way that even large villages are frequently concealed until you come close upon them. The contrast is then very striking between the treeless country with little green in view except the willows along the river, and on the other hand the extreme luxuriance of the fruit trees round the village; walnuts also grow to an immense size wherever the hand of man chooses to encourage them.

Finally, we have great alluvial plains, some of them extremely rich, but in general giving the impression of wasted aridity, such as we associate rather with Asia. Here we touch the second of the two most notable geographical features in the Balkan, the fact that it is the frontier land of Europe. Here Europe shades into Asia. The shores of the Bosphorus are both alike, yet on the northern side you cannot say that the scenery is anything but European; on the other you may



BUFFALOES IN EUROPE, INDICATING THE PROXIMITY OF ASIA.

equally protest that your surroundings are Asiatic. Thus the two great qualities of the Balkan are these: (1) Its form is that of a broad chaos of mountains, an Italy of a vaster and ruder kind; (2) its position is that of a frontier on the borderland of Asia.

But to generalize effectively requires an expert of the first class; the best that an amateur can do is to say exactly what he saw, and I shall contribute most to interest geographers if I name only the peculiar and striking phenomena that I have seen; these give the country its character, and distinguish Balkan geography from that of other lands.

What is the notable characteristic of Balkan geography? The student of the picturesque might claim that the Balkan is a land above all others of striking scenery. He might dwell on the fact that it includes some of the most famous features of the world, particularly in respect of lakes, of harbours, and of hills. Certainly among the sights of the world should be included the Gulf of Cattaro, where the steamer threads her way under black walls of rock 4000 feet high, into the very heart of the Balkan range. Those who have seen Ochrida are bound to claim it as a thing unique; and the remote valley of Rilo, framed in peaks and forests, and set as with a gem by the gilded roofs of the vast

monastery, forms, undoubtedly, one of the wonders of the Earth. Or, again, we might select as the distinguishing note of the Balkans the quality of variety. But I think that which is most typical is a certain habit of contrast, amounting almost to paradox. When the peninsula has been explored, this will form a rich store of material to every geographical society. Time will only permit now of a few further examples.

Whereas in Italy the great plains assume their natural position at the foot of the mountains, in the Balkan they often occupy the heights. Thus, also, the rivers rise in plains. Before plunging through deep gorges, they have wound a sluggish course through muddy creeks upon such high plateaux as those of Kossovo, where the notorious Austrian railway is now to be constructed. Here no less than three great rivers rise and flow in different directions, the Drin, the Morava, and the Vardar. On the plain of Sofia, at the very centre of the peninsula, although at the foot of towering mountains, you are yet at such an altitude that the climate is bracing, like the Riffel Alp.

A very peculiar form of plain is the absolutely flat deposit of soil in a basin sharply surrounded by steep hills. These are known by the Slav name of Polie, and are most marked in the north-west and in Montenegro, where, on a tiny scale, almost hidden among the interminable



RILA MONASTERY IN BULGARIA.

rocks, they form the sole means of subsistence of the Montenegrin peasant. They are, in a magnified form, the counterpart of the pot-holes of Yorkshire.

Similarly, the enormous limestone rivers which spring suddenly to birth are exaggerations of our own chalk streams; and, indeed, it is difficult to distinguish the delightful gradations of English chalk-country till one has seen the same features in their most obvious form in the Balkans.

Sometimes these streams are not exaggerated, but exact, reproductions of Hampshire trout-streams. The most astonishing combination of contrasts of this kind is to be found at Philippi. Driving from Drama, where the British officers are quartered, along the only road in European Turkey which appears to be secure and employed for commerce, you come across the plain to a Turkish inn. A few yards away are the remains of the Roman town, and vast Corinthian columns stand up among the bare fields without any indication that there had ever been reason for men to collect and live upon the spot. A little below, on the very edge of the plain, there are willows, and what looks from a distance like an oasis in a desert; but strolling down to the water, you find without exception all the notable features of a Hampshire trout-stream. Rising suddenly in a reedy marsh, it glides away with even course and regular depth through meadows with fine grass and absolutely crystalline water. You see something rise in the water as you walk along the bank, exactly like a trout. And here alone does the slightest difference appear between the Macedonian and the English stream, for the trout proves to be a water-tortoise.

Elsewhere, and especially I remember on the northern slope of the Rhodope, you come suddenly on a grassy hillside with straggling woods of Scotch fir, where you can hardly believe yourself to be elsewhere than in Forfarshire, till, riding down towards the vineyards of the lower country, you hear a shout in front of the cavalcade, and see a couple of bears galloping off into the wood.

On the southern side of the ranges the pines seem to find insufficient moisture. But on the other you get the autumn colours of Northern Europe in their most gorgeous quality. Pear-trees, which stud the slopes of the Rhodope, turn in September to a scarlet which is certainly not rivalled elsewhere, and I have never seen a more astonishing effect than a pear-tree half covered with wild vine, adding a different hue of scarlet as well as of gold. Occasionally the contrast is thrown into more striking proximity, where on the southern side of a range the shoulders run to a sharp edge, and you may notice a series of such shoulders, in every case growing pine trees on the south-west side, exactly to the sharp edge of the ridge, while on the east, where the soil is dried by the early sun for the whole day, no tree contrives to exist.

Within a few miles of the splendid forests of *Pinus Macedonica*, you

find yourself on the plains among tropical palms. Whereas the British Empire must stretch from Canada to India in order to exert "Dominion over palm and pine," the Sultan of Turkey includes both in Macedonia. From the palms, again, a few hours' ride takes you to fields of mountain colchicum, the autumn crocus. Starting in the early morning before sunrise, I have seen acres of these flowers lying in the frost as if dead upon the grass. An hour later, when the sun had climbed over the hill, they start up and open to such width that the whole hill-side will be violet-coloured in a few minutes. Higher up, again, in springtime you see grape-hyacinths and chionodoxa, contrasting their azure blue, as they ought to do, with the snow. But in the same day you may find yourself down in the valley pursuing an English lane with blackberries and sloes and travellers' joy.

The quality of contrast is not confined to inanimate things. You may see the gorgeous roller, who reminds you of India, and, close by, the homely water-ouzel. By the side of oaks and walnuts you find great tortoises and snakes 8 feet long; and bears and wolves abound. They are a serious drag upon industry, and even in civilized Bulgaria it has lately been found necessary to increase the Government rewards for killing them. I believe it to be a true story that a party of peasants with horses was not long ago wholly destroyed by wolves in the Mori Hovo mountains, nothing but the bits and stirrup-irons being found to record them. In the same hills the peasants migrate for the summer to lofty shoulders, where the land is flat enough to grow little patches of maize, and here, night after night, they will sit up with a fire to drive off bears; there are tragic stories of women with a baby in one arm, beating off a bear with the other with a burning brand from the fire. The prevalence of eagles is a delightful feature for the traveller, and on the cliffs of Montenegro I once counted, at the same moment, thirty-nine ravens.

The paradox observable in nature extends to Man, and I hope geographers will ere long collect further proof of the point which I now wish to make—that here is a case of the influence of geographical conditions upon man of extraordinary interest.

The Balkan is a country of mixed types of humanity. You have six separate states, and even more distinct nationalities. You have the Albanian, universally famed for his loyalty, his love of country, his preference for living on the fruits of other men's labour, with his interesting language and character, yet without any political existence—without even a government provided by another power, and forbidden to exercise the ordinary rights of man to such an extent that only outside Albania is there a single book allowed to be printed in the Albanian tongue. You have the Greek, clever and active, and conspicuous as a trader and a politician. You have the Serb, full of poetry

and romance; you have the Bulgar, noted for industry on the land and for a curious stubborn optimism so remarkable that I must give an example. An Italian officer lately received an answer from a Macedonian Bulgar that illustrates it well. The men of a certain village were accustomed to cut wood on the mountain, but so many of them had been killed when at work that the officer asked them why they continued to run the risk. The peasant replied, "Why should we not continue to cut wood? If we are not killed we shall bring back the wood." You have Wallachians, Jews, and Mohammedan Bulgars, descendants of Slavs converted by force, as well as Greeks of the same kind. All these add to the confusion of types; and, finally, you have the dominating Turks, of a temperament wholly different to all the others, admirably fitted to make useful peasants, normally a sleeping volcano, but under present circumstances a volcano in full eruption.

What is the cause of this confusion of types? It is the geographical situation of the Balkans as the debatable frontier land between Europe and Asia, combined with its mountainous character.

Many paradoxical contrasts are produced by this confusion of races and religions. It must strike you as a very remarkable thing when you first go among the Pomaks, as the Moslem Bulgars are called, to see the peculiarly aggressive expression that characterizes Mahomedans, combined with the blue eyes that suggest Europe; the colour is inappropriate, as you judge from experience of Turkish faces. Incidentally, it is a curious phenomenon that these blue eyes are not common among the Bulgarians proper, which appears to indicate some difference in blood, contrary to the theory that the Pomaks are of the same race.

The combination of European blood with Asiatic religion produces a pleasant contrast in Bosnia. The Moslem fatalism which takes full effect in a Turkish country produces a general air of decay, and much indifference to economic progress, but it is powerless among the Bosnian Slavs to remove their natural industry and optimism, and Mahomedanism takes on quite a different colour when you see a number of clean and well-dressed men of business attending spotless and up-to-date mosques with an air of progressive activity.

I found a still older combination in one of the educated Mohammedans at Serajevo. He had been taken in to the Austrian Governmental service. He was descended from a notable family of Bogomils, those early Protestants who, at the Conquest, preferred Islam to the persecutions of the Greek and the Roman Church, and became the most fanatical of Mahomedans. My friend and I engaged this gentleman as dragoman, and started out with him on the first day with a modest lunch, largely of ham and whisky, with suitable food for the true believer; we bashfully produced the ham, fearing to offend him, but to our great disgust he proved even fonder of ham than ourselves, as also of whisky.

It appeared that, though a Mahommedan, he was what he called a Liberal. We afterwards crossed into Montenegro, where his fez might have proved unpopular. But here to our surprise he appeared in a European cap, till we again crossed the frontier, this time into Turkey. In all, he changed his religion three times, avoiding awkward consequences with great skill except on one occasion at the famous monastery of Ostrog, where he found it convenient to join with us in declaring himself a Protestant. Here he was completely cornered by an inquisitive monk, who demanded a full explanation of Protestant views upon the worship of the Virgin.

You have other strange products in the way of human nature. The Albanians are divided among the Mahommedan, Latin, and Greek orthodox creeds, but their religion is of a precautionary character. I have known an Albanian chief, nominally a Mahommedan, who attended the mosque on occasion, but also maintained in the precincts of one of his castles, a small orthodox monastery, which guarded a mediæval Christian chapel, and here he maintained a Greek monk in virtual captivity.

Again, you have a strange anomaly in the shape of a married Roman Catholic clergy, the Uniates, as they are called, mostly descendants of Bulgarians who applied for membership of the Roman Church some forty years ago, having received special dispensation from the Pope.

Finally, you have priests who, in place of any Christian function, have become busy organizers of murder for their nation's sake; and in the last few years you have large numbers of men, of a naturally good *morale* as men go, turned in point of conduct to brutal beasts, devoting the admirable powers of a European people to acts of diabolical cruelty. And all this, I maintain, is the result of a purely geographical fact—the situation of the country as the outpost of Europe.

What, then, are some of the results of the inter-action between the geographical conditions of the Balkans and the various types of humanity that play their part in this environment? In other words, How does the geography of the Balkans affect Industry? Both production and transport are profoundly influenced by it. And, again, the peculiar effect is—Paradox.

Take the two great qualities that we have observed in the Balkans: its mountainous physique and its inter-continental situation. The first has profoundly affected industry by inspiring the habit of aspiration, by offering the chance of freedom to live and earn the fruits of work in civilized fashion. Thus, over a large part of the peninsula people have arrived at the opportunity of industrial progress. At the same time owing to the remaining influence of the second feature—the neighbourhood of Asia—industry is still in a mediæval form. You

have open threshing-floors with ponies treading the corn, and you have everywhere that most perfect combination of Man and Nature, whether in England or elsewhere—the water-mill—in great abundance.

Where the aspiration given by the mountains has produced national freedom, you have some of the happiest lands. It is true that you have strange contrasts. While, as you travel on the Danube steamer, you may see automatic reaping and binding machines from Lincoln or Ipswich, being landed for the Balkan peasant, his neighbour is usually living in needless poverty because he prefers still to turn the soil with his wooden plough. But the traveller will immediately see that he has passed into a world of exceptional charms. Ancient and gorgeous



A MARKET IN THE LIBERATED BALKAN COUNTRY.

national dress confronts him at every village; there is a deep current of prosperity and happiness following on liberation. The monasteries, formerly robbed and ruined, but always the centre of national hopes, are now the scene of such festivity as the west has forgotten. At Rilo or Studenitza or Trojan, thousands of pilgrims gather to celebrate the great festivals of the Church. Treated as the guests of the monastery and fed by the monastic kitchen, which at Rilo has a cauldron capable of stewing two oxen at once, they spend the days in a happy combination of commerce and festivity; dancing occupies the evening, and you may still see the blind minstrels of Homeric quality, singing of national glories to the home-made guitar. Religion, also, has its

place. Service in the chapel begins at 5 a.m., and at daybreak you will hardly find standing room.

Round the villages there is often a large common, where the dun-coloured cattle of the peasants graze together; in the evening each beast finds his own way home and pushes open the door of his master's yard. In these meadows on Sunday afternoon the village gathers for the national dance; circled round the fiddler or the piper you will often see a hundred men and women footing it with interminable vigour.

Commonly, as civilization increases the picturesque disappears. But in these newly liberated countries the effect is often in the other direction. The minarets usually remain, and there was little else of any beauty before the liberation. The houses are rebuilt with wider eaves. Roads are made and planted with trees, and orchards begin to relieve the monotony of fields with which it was not worth while to tend when the produce was wholly taken from the farmer.

In these countries the mountainous quality of the land, giving liberty, has gained the upper hand. Elsewhere the second feature—nearness to Asia—is still the dominant factor.

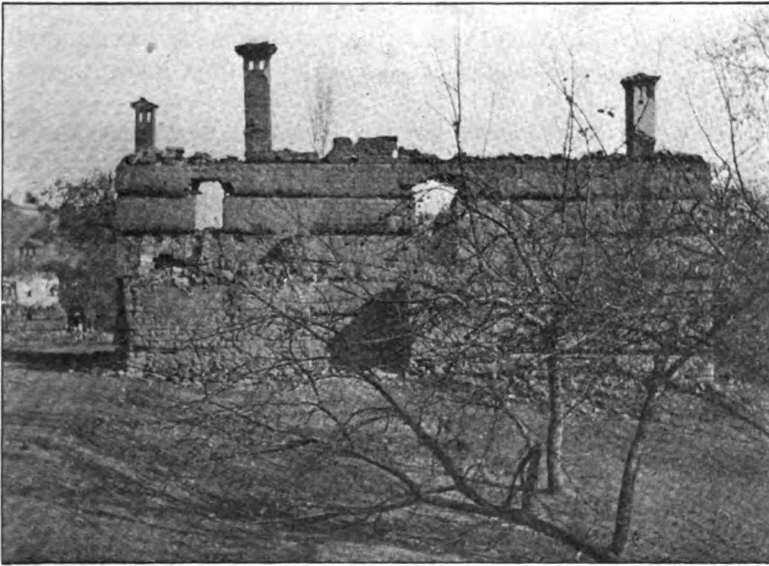
Here we have still stranger contrasts. In regard to production, we can hardly believe that this country was once the granary of Rome, so little does it now produce. The man who imports machinery or attempts to better himself by working a factory or mill, is lucky if the Governor does not trump up against him a charge of murder and throw him into prison until he has disgorged his fortune. Thus in literal fact the most attractive industry for a man of energy and efficiency is that of brigandage. Of intellectual professions there is absolutely none to satisfy an active mind. The literature of the country consists of the records of murder kept by the European consuls, and the lists drafted by murder committees of those destined to be punished with death.

It would appear from the markets of the large towns that the most profitable field of business is in fire-arms and large knives. But these do not adequately indicate the extent of the trade, for beneath the surface a large importation of modern rifles is carried on from the neighbouring countries into what is left of European Turkey. Here is another strange contrast: I have seen in the mountains the villagers collected for hunting bears with ancient flint-lock rifles, while the Turkish gendarme carried a Martini, and this again was vastly inferior to the Mausers or "Manlichers" which accompany a rebel band. The best of the thought and effort and wealth of the people is thus turned away from real to false industry.

Disorder is even causing a progressive diminution of production. Many a mountain-farm is now unsafe to visit, and a European resident who has done much big-game shooting tells me that recent troubles have in this way greatly increased the stock of red deer. Meanwhile, valuable forests are being rapidly cut down: reafforestation is totally

neglected, being often prevented by the unregulated grazing of herds of goats.

It may even be that the bare and coarse-looking surface of the rich lands of the Balkan is partly due to the absence of that continual human care which, doubtless, in Europe has done much to produce the firm texture of the meadows. In this way the habits of man have affected the landscape; but there is a weird story in Bosnia which puts cause and effect the other way. It is said that a Turkish farmer used every week to miss one of his sheep. At last he discovered that his shepherd, having killed the sheep by the river, threw it into the stream where, in Bosnian fashion, it plunged under the hill. The man's brother waited



INDUSTRIAL WASTE: A BURNT FARM.

at the appointed time to meet the carcass where it emerged from the ground on the other side of the hill. The Turk said nothing about his suspicions, but one day cut the throat of the shepherd, threw him into the river, and enjoyed the thought of the brother's discomfiture when, instead of the sheep, the shepherd's body appeared! It is said in Bosnia that the peculiar features of nature are in this way responsible for the habits of man.

The truth is not so different as might appear. Purely owing to the contiguity of Asia, we have here, among a people of European stock, good *morale*, great ability, and the mentality of civilized Christendom, a periodical destruction of all the means of industry and domestic life. More strange than this, we have such daily discouragement of

economic work that we stand astonished before the hardihood which prompts the peasant laboriously to rebuild the whole fabric of his industrial life as soon as the whirlwind has passed.

One of the rich countries of the world is actually turned into a source of heavy loss to the state which attempts to govern it, and even beside the modern steam-mills of Salonika, protected by their foreign ownership, perpetual murder goes unpunished.

The greatest proof of our thesis that geographical factors are mainly responsible will be found in connection with the greatest modern industry. The methods of transport in the Balkans range from the luxury of a French sleeping-car to the still prevalent plan by which whole families, when the annual migration takes place between the plains and the hills, are fastened on the backs of one or two ponies, the heads and arms of the smaller infants protruding from different parts of the family stock of blankets!

Nothing is more needed for the industrial development of the Balkans than railways. But so far, over a large area, the few railways that exist are built for strategy alone. There must be really commercial, non-political railways. To illustrate the extent to which geography has prevented this primary development of industry, the R.G.S. has prepared a special map, designed to call attention to the contrast between railways actually built and those which would exist but for the geographical influence of Asia—an influence which can and will be modified. These include both those which are now proposed, and others which are economically desirable.

The Austrian Novi Bazar line, which has had such startling results, was forecast by the Berlin Treaty thirty years ago; and the work has lately been pushed on with feverish haste to the Turkish frontier. It is strategic, but no less welcome. Through traffic goes quicker through Serbia, and the Bosnian line is, moreover, only "narrow gauge." Austria, also, favours the connecting-line with Greece. The turmoil raised by the Austrian advance showed at all events what other States thought of its character. The "Slav line" from Serbia to the Adriatic at once achieved reality. Russia gave it her patronage, and Austria has given it her formal support. This line gives Serbia the double advantage of closer access to "Old Serbia," the historic Servian district, now cruelly impoverished by Albanians as well as Turks; and also of access to the sea.

A modified form of this scheme is proposed by Montenegro, whose Prince declares that unless the route is through his country, the port of Antivari shall not be used. This view has Italian support.

Italy has been working hard in Montenegro, and has built a line already, some distance towards Podgoritra. She also urges another trans-Pindus route, from Monastir to Durazzo, along the old Roman

road. These schemes are strategic, but also economic. The maps kindly prepared by the R.G.S. show that their construction is perfectly feasible. But in a normal condition of public order, many other lines would be built for economic motives alone. Such are those that follow the valleys of the Struma and Mesta. What would be done with a state of security may be judged from the wonderful progress of railways in Bulgaria, a country till thirty years ago in the same condition as Macedonia to-day.

It will be seen that one geographical influence is still at strife with another; but "the Battle of the Railways," which began in January, initiates a reconciliation, for all the proposed lines are economic, even



THE PRESENT CONDITION OF THE AUSTRIAN RAILWAY ROUTE.

the Austrian strategic railway which led to the crisis. Some of the lines will pay by reason of through traffic, all of them by means of local development. Even those which run through mountainous country will pay when the nature of the government permits of mining. My evidence for this statement will be strongest if I quote the actual consular report of our own government. The consul at Ushub says—

"As there are no official statistics and all figures must be obtained by private inquiry, their accuracy is at the best only approximate.

"The province of Kossovo possesses all the latent possibilities of very real prosperity, but political conditions at present frighten capitalists and paralyze industry.

"There are mines of every description in the province, and the mineral wealth of the country is said to be comparable with that of the Transvaal, but owing to the great difficulties of transport and the insecurity of the country, few mines have been exploited up to the present, but concessions are now being more eagerly sought after. Gold, silver, copper, iron, chrome, lead, antimony, and manganese, besides coal (lignite), have all been found in considerable quantities, and fresh discoveries of lodes are continually being made. A British company will this year start working a silver and lead mine near Kratova, which is believed to have very good prospects; it was worked by the ancient Greeks, and is one of the mines mentioned by Herodotus. The chrome mines near Kalkandelen cannot yet enter into competition with the New Caledonian chrome mines owing to the excessively costly transport of the mineral to the coast. Coal mines are plentiful, as at Kalkandelen, Prisren, Yeniky, etc., but the quality does not appear to be very satisfactory.

"There are quarries of excellent building stone on every side. Further, a small slate quarry is situated at Papadia, and supplies local needs.

"The soil produces excellent cereals, tobacco, opium, and poppy seed; in some districts the pasturage is all that can be desired; and in the western (Albanian) region fruit trees do well, especially apples and plums. As before mentioned, a fine edible grape comes from Strumnitz.

"In some of the less accessible parts of the province there are immense forests of oak, beech, fir, pine, ash, and chestnut, which, according to official statistics, cover an area of 750,000 acres of ground. On the other hand, the Turks, with their dislike of cover, have cut down all the forests in the vicinity of the towns, and firewood is now scarce. However, owing to the establishment of a saw mill at Mitrovitza, planks for building purposes are beginning to be supplied by the country itself."

The chief feature of the situation to-day is Waste. Firstly, Europe has no access to Greece; that is to say, she is neglecting by far the nearest route to Egypt and the East. Again, half the trade of the Balkans is virtually debarred from its natural outlet on the Egean sea. Most wasteful of all, the other half is unproductive for want of government. Finally, this last fact prevents the development even of the free states. Through traffic being impossible, there is not a single railway bridge across the Danube from Belgrad to a spot near the mouth; so that to travel by rail from Russia or Bucharest to Bulgaria, you must go round by Hungary.

What are the factors which cause this waste? They are: first, disorder, minimizing production, actually necessitating a continuous line of soldiers along every line in European Turkey, and preventing the building of new lines except where the Government guarantees

the revenue. These guarantees make the railway an actual injury to the country. The guarantee of the Austrian lines is 7000 francs per kilometre. The German and French lines have more than double this amount. The German has lived, by this means, on the local taxpayers to the extent of £50,000 sterling per annum; the French of no less than £220,000 per annum. Thus the companies have no motive for developing traffic, and, as the lines avoid the sea and the towns, it is even discouraged. Only in 1897, when the Greco-Turkish war brought good trade (actually trebling that of the German line), did the French subsidy fall below £175,000.



INDUSTRIAL WASTE: MOSLEM ALBANIANS FULLY ARMED.

Military strategy is another anti-economic factor. The unsettled claims to Turkish Europe are responsible for opposition on grounds of strategy, and the Italian, Servian, Montenegrin, and Bulgarian schemes.

Another factor, closely allied with the last, is the partiality of local interests arising from artificial boundaries. Goods from South-West Bulgaria, which is not far from Salonica, are sent round by the Black sea, in order to aid the ports of Varna and Bourgas; while the Sultan suppresses his Adriatic ports because he has property at Salonica.

But "the railway rush" has begun, and before many years have passed, we shall wonder how Europe tolerated so long the absurdities we see to-day. The European and mountainous quality of the Balkan

peninsula will have overcome the influence of its marginal, semi-Asiatic, situation.

In conclusion, I ask you to remember that we are solely considering the question put forward by the Society as the proper subject for discussion. How far Man and Industry in this country have been influenced by the geographical conditions? All frontier countries, even Afghanistan or Persia, must in these modern times be the scene of confusion and paradox, and are properly the subject of special study, to be encouraged by geographical scholarships or any available means. But I would venture to urge that when such a country lies at our very doors, the call to our geographical societies to throw light on it is more than ever paramount.

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The PRESIDENT: Although the lecturer of the evening, Mr. Noel Buxton, has been some ten years or more a Fellow of our Society, I think that the older members among us probably regard him rather as the son of Sir Fowell Buxton, whom we are glad to see here to-night. It may interest you to know, that Sir Fowell was elected a Fellow of the Society in the year 1858, so that this year he may be said to be keeping his golden wedding with Geography. Of course, Mr. Noel Buxton, as a geographer, stands upon his own feet, and as regards the portion of the world about which he is going to address us, the Balkans, he has not only travelled extensively there, but is also regarded as one of the leading authorities. I will now call upon Mr. Buxton to read his paper.

Mr. HOGARTH: I am sure we all thank Mr. Noel Buxton for calling our attention to so interesting a country as Macedonia, a country which, after all, is so singularly little known to us here in the west. Even if it is no longer quite true, as Gibbon said, that on one side of the Adriatic is a country as little known to Europe as Central Africa—although perhaps, relatively, that does still continue to be true, for, while we know a good deal about Albania, we also know a good deal more about Central Africa—at the same time it is true that Albania is the least-known part of Europe, and Macedonia is not much better known. It is a singularly interesting country, and also a valuable country. Mr. Buxton has spoken to us about the remarkable variety of scenery which it presents, the remarkable difference between the highlands and uplands. I would only recall your attention to the fact that the best cigarette-tobacco in the world comes from Macedonia; that all the best tobacco (when it is tobacco at all) in European cigarettes comes from Macedonia; and that when it does not come from Macedonia, it is said to come from there. It is, as Mr. Buxton said, a country of very great contrasts; and it happens to lie within an area of Europe which has a fairly abundant rainfall. Mr. Buxton has, of course, indicated to you quite sufficiently why that country is in the condition in which it is. He said, and quite sincerely, that he intended to avoid politics; but it is perfectly impossible, in this connection, to avoid politics, or at any rate to avoid, I won't say the suspicion of them, but the reflection of them. Mr. Buxton spoke to you about the marginal Asiatic character of Macedonia. That, of course, results simply from the continuance of a certain form of government, and means a certain state of political conditions. The reason why Macedonia is such a turbulent country under its present Government is supplied, on the one hand, by its geographical character—its Swiss character, as Mr. Buxton has very well called

it; and on the other, by the fact that it was not conquered solely for Islam by the Ottoman Turks. If you regard the Ottoman empire without going into its earlier history you may forget that the greater part of it in Asia was not originally conquered by the Ottoman Turks, but by other races of Turks, other races of Mohammedans holding sway before the Ottoman Turks, which had quite different ideals as regards the spread of religion. These were first and foremost proselytizers, and they forced the inhabitants to adopt the Mohammedan religion; they conquered, in fact, first and foremost for Allah, and only, in the second place, for their own personal gain. That, of course, was pre-eminently true of the Arabs, wherever they went. An Ottoman Turk, when he conquered, conquered first and foremost for himself, and only in the second place for the Allah of the Moslems, and he was, therefore, very careful not to convert beyond a certain point. Careful not to preclude himself from having serfs and slaves to his order, people who had not the privileges of the Moslem sacred law—hewers of wood and drawers of water. The Ottoman Turk, therefore, only converted the population to a certain point. He established garrisons in the country, and was perfectly indifferent as to what happened to the rest of the inhabitants; indeed, from the very first, up to this day, he has fostered disorder and disunion in the country. The result is, that there is not in Macedonia, and never will be, anything like the peace and the order which prevails upon the great plains and great plateaus of Asia Minor.

It is not, of course, our function to-night to debate about the means which may be taken to bring that state of things to an end; but it does come within the province of this Society to consider how far the condition of Macedonia may be slowly and effectively remedied by the promotion of railway enterprise. I would only say that I hope no selfish considerations will ever prompt this country to put any hindrance in the way of railway development in Turkey. A very great responsibility rests upon any nation which prevents the extension of railways in a country so comparatively undeveloped as Turkey in Europe at this moment. And this applies to Macedonia. Macedonia is a country which wants railways, and, as Mr. Buxton pointed out, the natural outlets are all on the *Ægean* sea. The country slopes down to the *Ægean* sea. From that great tableland of Kossovo there are at least three main routes which lead down to good harbours, and upon those routes railways are the only means of communication which are likely to be useful. The rivers, although of considerable magnitude, fall so steeply, and are so subject to differences of level in winter and summer, that they can never be expected to supply effective means of water-transit. I think that in the near future we shall see at any rate a beginning of the construction of railways. We need not be too precise as to whether these railways are, or are not, strategical. A strategical railway has to follow more or less natural lines of communication. Experience has shown that population will follow the railway, and that a railway, if it is made anywhere, is pretty sure to cause an extension of trade. The chief thing that we have to see to, so far as our political influence extends, is that those bad economic terms are not imposed, under which most of the strategical railways have been made. Mr. Buxton has described those to you in figures which you may not have followed sufficiently well to realize their enormity. In the case of a certain recently constructed line, the Government have had to give a guarantee of 13,000 francs per kilometre. The maximum earnings which can be foreseen for that line for many years to come are between six and seven thousand francs per kilometre. That means that the railway is going to be a drain on the local taxpayer for more than half its expenses for about as long as we can foresee. That is a very bad state of affairs, and should not be tolerated. Railways can be constructed independent of the kilometre guarantee. It can be done, and it has been

done with the British line from Smyrna to Dineir. That line has never had a kilometre guarantee, and is carried on at a very respectable profit. Let us not put any unnecessary political difficulties in the way of the construction of railways in Macedonia, but use our immense influence to provide that the local taxpayer, whether Moslem or Christian, be not burdened with a wholly unfair tax upon his daily earnings in favour of large capitalists and company promoters in other countries of Europe—England, France, or Germany.

Mr. MACKINDER: I cannot pretend to the local knowledge of Mr. Noel Buxton or of Mr. Hogarth, and would venture to limit what I have to say to two remarks. I think that the maps usually available hardly suffice to show how natural is the proposed railway to the Adriatic sea. There are two lines drawn in red on the hand-map before us, from the town of Nish south-westward to the Adriatic sea. These two lines, the Montenegrin and Albanian alternatives, both run through a hollow—as it were a street cut right athwart the Dinaric and Pindus backbones of the peninsula. The fact is that Bosnia, Herzegovina, Montenegro, and western Serbia should be thought of as a plateau, which comes to an end with a sharp brink, overlooking the hollow through which these two lines are drawn. There is a second brink south of the second of the lines, and thence a mountainous district extends southward through Albania. Thus in reality there is no backbone running down the west side of the Balkan peninsula; but where you see the change in direction in the east coast of the Adriatic sea, there is a natural thoroughfare from the Adriatic coast northeastward leading into Serbia. What is proposed is to construct a railway through that, which, so far as gradients are concerned, is far more natural than the railway which is proposed, for strategic and other reasons, from Bosnia to the Ægean sea. The rivers, of course, do not indicate these facts, and the only map upon which they come out, I think, with sufficient significance, is the Austrian Staff map. The essence of the matter is that we are not dealing with a range of mountains, but with two plateau regions, and between them a deep gutter.

As to my second point, I do not think, if Mr. Buxton will allow me to say so, that it is a quite sufficient analysis of geographical influence upon the present human conditions in the Balkan peninsula, to say that this is a marginal region; rather, I would venture to say, it is the central region which lies between Europe and Asia, and for that reason must be one of two things—either the seat of conflict or the seat of Empire. It has been the seat of Empire through long centuries, as Mr. Buxton said in an early part of his address. At Constantinople you had the great city which set at defiance both the Slavs of the west and the Saracens of the east. The present condition of the Balkan peninsula is a significant illustration of the fact that thorough conquest may be humane, but incomplete conquest is the most inhumane thing there can be. Just because Rome conquered in the west, and, because of prior Greek civilization, did not conquer in the east, and because the Turk also, though for more sinister motives, did not conquer the east completely, therefore this central district, when it ceased to be the seat of empire, passed into a condition of unstable equilibrium, with warring intermixed peoples and no dominant nationality.

I entirely agree with Mr. Hogarth's idea, that we ought to foster the making of railways here. The more we develop this region commercially, the more we shall tend in the long run to build up a centre of force which will prevent this portion of Europe and Asia from being the seat of conflict. It must either be the seat of force acting outward, or the centre of the conflicting forces acting from without. I do not think, sir, I can say any more, than that I have listened with extreme interest to the very graphic illustrations of the scenery and the climate which Mr. Buxton has drawn for us. With reference to his idea of research

scholarships, I would venture to suggest that the thing to do is to find the right man and to endow him, and not to offer for competition chances which may, or may not, attract the right man.

Mr. CHISHOLM: After what has been said by Mr. Hogarth and Mr. Mackinder there is practically nothing left for me to say; and, in fact, almost all I could say would be to echo the last words that have fallen from Mr. Mackinder, and to say on my own behalf that I have listened to this paper with the very greatest amount of interest. Seeing, however, that you have asked me to say a few words, I will take the opportunity to give expression to one or two generalities. What I have to say is founded upon the very hopeful forecast that was made by Mr. Buxton himself, and also supported by Mr. Hogarth. Mr. Buxton says about the conclusion of the paper, "the railway rush has begun, and that before many years have passed we shall wonder how Europe tolerated so long the absurdity we see to-day." I am glad to think that we may accept that statement with a very considerable amount of confidence. It has often been remarked that the last century that human history has passed through has perhaps done more for the world in some directions than all the other centuries put together; and in fact, I am now old enough to reflect with a good deal of surprise upon some of the astonishing changes that have been in my lifetime. When Japan first began to be opened up to Europeans, I can remember reading the leader-writers in our papers urging our merchants to make hay while the sun shone, and warning them that Japan would soon go back to the condition in which it was before. Well, I have lived to see that and many a similar forecast falsified. With regard to railway construction, one thing noticeable is this, that once an important railway has been made through a country it alters the economic equilibrium, and creates the desire for more railways. I am very glad to think that the forecast which has been expressed by Mr. Buxton is very likely to be verified.

H.E. the SERBIAN MINISTER: Having the honour of being here to-night as a guest of the Royal Geographical Society, I very highly appreciate being called upon now to say a few words after the very interesting paper which Mr. Buxton has read to us, and after the very interesting and able remarks which have been made by Mr. Hogarth and Mr. Mackinder. Of course it has been said that no political discussion can take place in this room. But this restriction does not diminish the importance of what has been said and of the subjects of this evening's discussion. There is, in the first place, the scientific geographical interest which has been shown in the Balkans, and the character of their inhabitants. On the other hand, the construction of the different railway lines which are now under consideration is of such prominent importance to all the regions concerned, that I think it is quite sufficient to dwell upon those two points. As the representative of one of the countries of the Balkan peninsula it is quite obvious that I should have to lay before you a good many different observations concerning the details of the subjects discussed. But I am not prepared to speak to-night at length on the subject, nor should I like to detain you longer at this late hour. I feel, however, bound to express my very deep thanks for the very interesting remarks which Mr. Buxton communicated to us. Having travelled so much in the Balkan peninsula, he is fully authorized to do so. I should further like to point out how much our own country is interested in the construction of the railway from our frontier to the Adriatic sea. This line will give to Serbia a direct outlet to the Adriatic, and revive the commercial routes which were in use centuries ago, when several important routes led from the coast to the interior of the Balkan peninsula, thus linking it up with Italy and the west of Europe. This railway will, without any doubt, improve the commercial position and economic

situation of our country and of the people living beyond our border. I may only be allowed to add that I feel sure that the interest which has been shown in this learned and distinguished assembly for the different railway schemes will have the most sympathetic echo from the scientific people of my country, as well as all the classes interested in the development of commerce.

Colonel PLUNKETT: Mr. Buxton has given us a most interesting picture in one of his slides—the distribution of the different races, but he omitted to mention the traces of the old Roman and Italian civilization, which are a very important feature on that coast. Politics are not allowed here, but in the spread and progress of civilization we are all interested, and I think we may see some recent revival of that old civilization which was once so distinct and which nearly disappeared; the making of railways from the interior to the Adriatic, more especially, perhaps, the southern of those marked, would convey that civilization into the interior, and in this way help to diffuse the highest type of civilization that has, since the old days of Greece, penetrated the peninsula. I hope Mr. Buxton will say something as to that very interesting feature, which I have noticed myself on that coast. I think we are all greatly indebted to him for his very interesting paper.

Prof. LYDE: If I may be allowed to say a few words, there is also a point which I should wish to raise as to the use of the words European and Asiatic throughout Mr. Buxton's lecture, in a sense which appears to me to lend itself to an underlying fallacy. Especially with regard to the Balkans where they have been used, I think it is particularly essential that these words should be defined. There is the fallacy of, on the one hand, distinguishing the geography of Asia from the geography of the rest of the world, and, on the other hand, transferring adjectives to other meanings not covered by geographical conditions. I should therefore be extremely interested if Mr. Buxton would explain in what sense a race coming originally from Asia, which has settled in Europe 500 years ago, is called Asiatic, whereas another race equally coming from Asia, but 2000 years ago, is essentially European. I should also be glad to know in what sense certain qualities found in mixed races in the Balkans, which do not happen to agree with the accepted western view of character, are to be classified as Asiatic and put down to an Asiatic origin, while other characteristics which suit the principles of our age are to be classed as European.

I do not believe in the commercial future of railways which have a bridge of 250 feet every 6000 yards, and a tunnel of 450 feet every 1800 yards. Besides, there are no products to go to the Adriatic. In Rumania the population is massed in the east, and in South-East Serbia the climate and products are purely "Mediterranean," and are not wanted in Mediterranean markets. The horned-cattle of North-West Serbia might go, but ought to be kept at home for ploughing. In any case, the whole tendency of traffic now is to go direct to its destination, and the destination of any mid-Balkan products is in the big non-Mediterranean markets of North-West Europe. To tell of Serbia being in "economic bondage" to her great neighbour seems perilously near nonsense when the significant feature of the contraband trade of the area is that it goes *north*.

As to the railways making for peace, I don't believe that railways, which go through strategic centres in districts where they have no products to carry, make for peace. The "Russian" line is projected through a belt of Slav population using Russian characters the whole way from the Danube to the Adriatic, and deviates to the centre of all the old military and political turmoil—Prisrend. The "Austrian" line taps the Ibar valley in which Pompey resided nearly two thousand years ago. If any railway is made, *all* the projected lines should be made.

Mr. W. A. MOORE: With regard to the last speaker but one, while I quite

agree with what he said as to the strategical intention of the Bosnian railway and also as to the strategic importance of the Serb-Adriatic line there there is one consideration which I should like to suggest, and that is this, that if the section of the railway that runs now through Nisch to Salonika were running under proper commercial economic conditions through what we call a civilized country, and if the harbour at Salonika were cleared and it were allowed to take its place as a great port—as one day it must—you would then have something which Prof. Lyde might bring into his scheme of traffic going north-west, because if you cast your eye on London, and then on Salonika, following the Orient express route across Europe through Vienna, and pursue the railway from Nisch to Salonika, and then in the same straight line southward by the water, you come to Cairo. Even now there is much traffic between Egypt and Salonika, and if the latter were a civilized commercial port, as it must some day be, then that would be the great continental route to Egypt, and you would have the traffic going north-west to Central Europe and the Continent. The projected lines, for instance, the Monastir-Avlona line, would then play an important part as branches of a great trunk route between London, Cairo, and the East.

The PRESIDENT: I am sure we shall all agree as to the extreme ability of the paper read by Mr. Buxton. I thank him on behalf of the Society for the careful way in which he has steered clear of politics. He was careful not to cross his "i's" and dot his "t's," in regard to certain matters, and I am very glad he did not do so. We have also had a very interesting discussion, and I am sure you would wish to thank the speakers for the able contributions they have made to the question.

Mr. Buxton: I beg to express my great pleasure in your most kind words; it is not for me to do more than thank you, except to make one comment. If I have been guilty of terminological inexactitude in using the word "Asia," I can only plead that its bearing is not great upon the question of geographical influence on human industry. With regard to Prof. Lyde's remarks, I think that the objections he made to railway development are answered by the fact that they would have applied to the prospect of similar development in Bulgaria, or any of the northern parts of the peninsula; but whereas they might have been held to make it futile to speak of railway development, this has been very great in those parts, and I think it has been to the immense advantage of industrial progress. The difficulty is answered by this fact, and is really dealt with by that unalterable law, Supply creates demand.

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## JOURNEY ON UPPER SALWIN, OCTOBER—DECEMBER, 1905.\*

By GEORGE FORREST.

THE journey described in this paper was undertaken by the late Mr. Litton. His object in making the journey was both political and geographical: first, to discover whether the Salwin and Irawadi dividing range formed a distinct geographical and ethnographical boundary between north-west Yunnan and Upper Burma—a fact which the local Chinese authorities, with direct knowledge, and for their own purposes, denied; secondly, to explore that portion of the Salwin valley lying

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\* Read at the Royal Geographical Society, June 15, 1908. Map, p. 328.

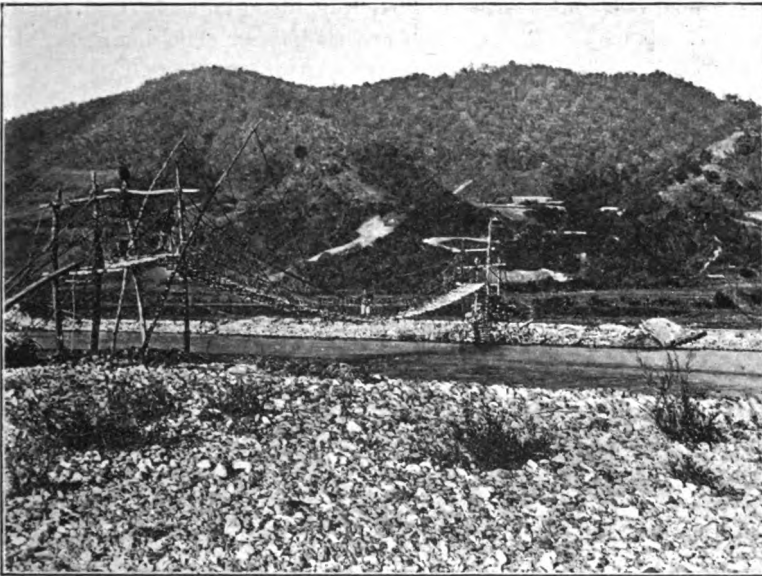
between 26° and 27° 30' N. lat., which, up to the date of our journey, was unknown. Mr. Litton received special permission from his Majesty's minister at Peking to make the journey. I accompanied him as friend and assistant, but primarily to prosecute further my botanical collecting, in an entirely new region. The journey was distinctly made under the leadership of Mr. Litton. The paper is a joint composition of Mr. Litton and myself. Mr. Litton, who was a Fellow of the Royal Geographical Society, would, had he lived, have given the paper himself, or had it communicated. The paper, as submitted by me, is changed in some respects, necessarily so, owing to his death, but I am specially anxious that my friend's major share should not be ignored. The photographs, I may say, were taken by myself.

Starting in perfect weather from Teng-Yueh on October 11, we travelled north, and on the fourth day passed the last Chinese village and encamped near the source of the Shweli, at the north end of the wild and picturesque valley of the Ming-kwong, near the Lissoo hamlet of Ta-chu-pa. The headman soon found us a sufficient number of porters, many of whom had accompanied Mr. Litton on his journey in the previous spring, and a day was spent in apportioning "pei tza," or loads, to be carried on the back, consisting mainly of a reserve supply of rice—a most important item in the baggage, as we could not count on buying any food to speak of in the country to the north of us. A Lissoo can carry on his back for full stages of six to eight hours, in difficult country, about 70 lbs. weight, but he eats about 1 lb. 7 ozs. per day of dry rice.

All preparations for a move forward having been made, our bad luck began. The south-west monsoon returned, and for twelve days an almost continuous deluge ensued. After waiting in vain for three days, we made a start in the rain, and climbed through the desolate and dripping forest which covers the N'Maikha-Shweli divide. It was only with the greatest difficulty that mules could flounder through the quagmires, while all the mountain brooks were so swollen as to be nearly impassable. Late in the evening of the second day from Ta-chu-pa we reached the first village in the Irawadi basin, the Lissoo hamlet of Tsu-yu-ho, consisting of a dozen rough shanties, situated in an opening in the mountain ridges. Ourselves and our baggage were thoroughly soaked. It was a choice between camping on sodden ground, under sodden tents and with sodden bedding, or taking refuge under the smoky and verminous shelter of a Lissoo hut. We chose the latter as the lesser evil.

For fully sixty hours at Tsu-yu-ho the deluge continued without intermission, and it was impossible to proceed, as we were everywhere hemmed in by raging torrents. At last we were able to make a short stage north through patches of forest and over ridges clad with dense grass, bracken, and a species of scabious, to the Lashi-Kachin village of

Pien-ma, forty houses, which Mr. Litton had visited during the frontier expedition of April, 1905. We arrived in a perfect downpour, and the stream, which also serves as a road, by which we came, was so swollen that, had we been an hour later, we could hardly have reached our destination. As it was, we lost one of our mules, and with it a bundle of my specimens. The headman put us up in his house, where we had to wait another two days for the cessation of the rain. On the whole we were delayed eight full days by this, for late October, unprecedented downpour. We were further delayed beyond Pien-ma for two or three days in the Ku-tan-ho valley by landslips, broken bridges, and other results of the weather. We never recovered this loss of time; besides,



SUSPENSION BRIDGE, SPAN 100-150 FEET, COMPOSED OF LIANA CANE AND SAPLINGS, ON THE MING-KWONG RIVER.

much of our kit was spoiled; whilst the men got colds, which laid the seeds of subsequent fever, causing later much trouble and delay. This track from Ta-chu-pa to Pien-ma is no longer fit for mule traffic, much of it having been swept away.

Pien-ma and Tsu-yu-ho are two villages nominally subject to the Chinese headman of Teng-keng, on the Salwin, but situated to the west of the divide, which is claimed as the British eastern frontier. The headman of Pien-ma by no means appreciates the benefits of celestial suzerainty; he complained to Mr. Litton that, after the frontier commission, the representatives of Teng-keng had come and seized some of his cattle, and carried off two girls from his village in satisfaction of tribute

supposed to be due. He repeated the request, made to Mr. Litton in April, that the British Government would take the country over and provide means for settling disputes, suppressing feuds, and regulating taxation.

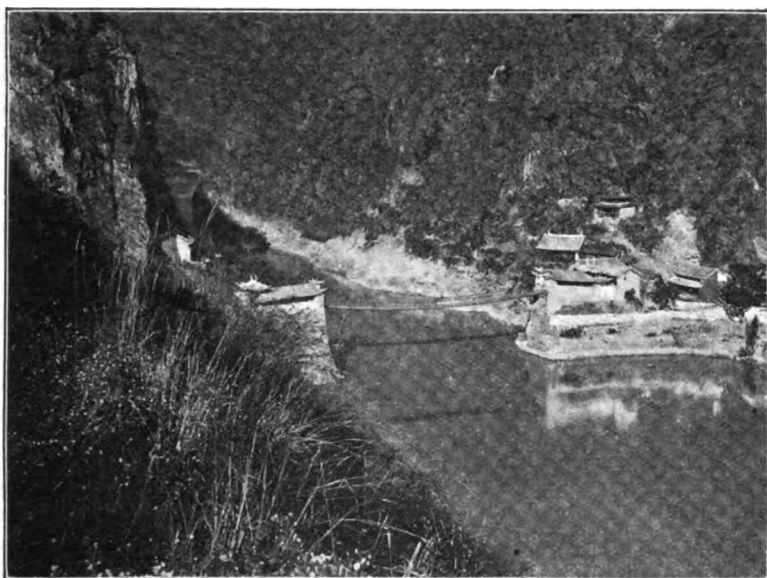
Among the villages north-west of Pien-ma there are continual feuds. Last summer one of these villages took some cattle, which they had stolen, over into Ming-kwong, in China, and sold them there on the bazaar, whereupon the owners of the cattle made reprisals on Ming-kwong traders. The *fu-yi*, or headman, of Ming-kwong accordingly "closed the passes," i.e. issued a proclamation that none of the Ming-kwong people were to go over the watershed to Pien-ma; but no one took any notice of the edict, and we met three or four traders *en route* to the Maru country along the upper N'Maikha. The condition of these villages is, in fact, the condition of all villages in that country which are not under the control of British officers. The nominal control of Chinese headmen causes far more trouble than it allays.

Having heard all about Pien-ma politics, we moved east over the Irawadi-Salwin divide by the lonely but beautiful Pien-ma pass, 10,500 feet, and descended the Ku-tan river, a tributary of the Salwin, where the swollen waters caused us much trouble. From the village of Ku-tan we turned north, and on October 30 reached the village of Lu-chang, the residence of a semi-Lissoo chief where Mr. Litton had camped in April. This we intended making our base for exploration further north. The village is in a fine and healthy situation at 6500 feet, some 3000 feet above the Salwin, and the people are most friendly. The chief, who is a boy of some ten years of age, came to ask us for a present of some sweets, and his lady mother, the regent, sent us a present of an unusually large capon. Both there and everywhere else where they went the British and Indian officials seemed to have left an excellent impression on the inhabitants; on our arrival numbers of porters came forward and asked to go north with us, while Mr. Litton received numerous inquiries regarding the various members of the party who had been north that length in the spring. If nothing else was effected by that expedition, at least friendly relations were established with people who had never previously seen or been seen by a European.

From Lu-chang we sent back the baggage animals, and proceeded on foot for three marches northwards—32 miles by the track, but only about 14 as the crow flies. The path leads up and down over a series of ridges descending from west to east down to the Salwin from the N'Maikha divide. To negotiate these ridges is a trial of strength to the traveller's legs. Thus, starting from Lu-chang, at 6400 feet, there is a steep drop of 3300 feet to the Salwin in 4 miles; then follows an ascent of 4000 feet, through grass and pine forests to the top of the ridge, 800 feet above the scattered village of Mao-chao (14 miles from Lu-chang), which, like Lu-chang, amongst its log and bamboo huts,

boasts one tiled house, the so-called yamen, the residence of the hereditary native chief. From Mao-chao there is a rough track which, after some steep ups and downs, plunges down 1500 feet to a tropical jungle of palms and lianas, through which runs one of the mountain torrents which are the only tributaries of the upper Salwin. Then a precipitous climb of 900 feet, through cultivated patches, leads to the ridge of Shih-pai-li-ti (8700 feet, 10 miles from Mao-chao). Between Shih-pai-li-ti and Pei-pa (8 miles) there is an even steeper gully, the bottom of which is 2000 feet below the level of the ridges.

In all this country the villages are scattered along the opener sections of the ridge tops, or on natural terraces in the mountains at



SUSPENSION CHAIN BRIDGE ON THE MEKONG RIVER, ON THE TENG-YUEH-TALIFU ROUTE.

from 5000 to 7000 feet. Above 7000 feet to the top of the divide the country is too steep and rocky, and the forest too dense, to admit of villages or cultivation; below 5000 feet the country is too malarious, but every village has its patch of rice-fields 2000 to 3000 feet below it by the banks of the Salwin, whither the inhabitants descend to sow and reap much as they did in the time of Marco Polo.

One and a half miles distant from Pei-pa, but 1300 feet below it in altitude, is Cheng-ka. Here there is a large open bay in the hills at 3400 feet, admitting of irrigation for some hundreds of acres of paddy land; the people are thus able to live near their fields, and are in a comparatively flourishing condition, possessing flocks of goats and droves of swine.

Cheng-ka, like all the villages along this part of the Salwin, occupies a site commanding splendid views. Far below, the river can just be seen; beyond it, to the east, rise the vast and varied slopes of the Salwin-Mekong divide, dotted with maize-fields and villages; while behind, to the west, tower the sharp ridges and forest-clad heights of the Irawadi parting. The inhabited or temperate zone of the range, say from 5000 to 7000 feet, is thickly cultivated with maize; and groves of pine, oak, and flowering shrubs, with hedgerows, covered in autumn with clusters of a trailing lilac-rose coloured *Crawfurdia*, pleasantly diversify the view.

As Cheng-ka is the farthest point north where the authority of the Chinese chiefs is more than a myth, I may here give some account of the inhabitants of that section of the Salwin ( $25^{\circ} 50'$  to  $26^{\circ} 30' N.$ ) which belongs to these hereditary T'u-szu, or chiefs.

The people are all Lissoo, but with a strong admixture of Chinese blood. The men dress in Chinese fashion, but the women, while adopting the Chinese cotton cloth, retain the petticoat and profuse decoration of head, bracelets, necklaces, and armlets, which is so characteristic of the true Lissoo garb. Few of them can speak any Chinese except the chiefs and their families. The people hardly go beyond their own villages, and seem to live quiet happy lives, only disturbed by the occasional difficulty of getting food, and by the trouble and petty exactions which attend the work of collecting the chief's tribute, or house-tax of half a tael per year. The usually peaceable condition of this portion of the valley is no doubt partly due to the general absence of interference by the Chinese mandarins, which is owing to the fact that the country is too poor to be worth squeezing. The chiefs have none of the machinery, and exercise none of the functions, of a regular government, except collecting their dues, in which they are assisted by a Chinese clerk. Each village seems to regulate its own affairs through its headman.

The country along the Salwin north of  $25^{\circ} 30'$  is referred to by these people as "Han-ti," or Chinese territory; but the subjects of the chiefs also refer to themselves as "Han-jen," or Chinese, as opposed to the wild tribes farther north up the river, who both are, and are called, Lissoo. Between those so-called "Han-jen" and the wild Lissoo there exist much jealousy and bad feeling.

Even at Cheng-ka mules and ponies are rarely seen; beyond Cheng-ka a very few dogs, goats, and pigs, with an occasional fowl or skinny ox, are the only domestic creatures. Owing to the severe famine which raged in these districts in the season 1904-1905, very few even of those are left.

The upper Salwin as far as Cheng-ka had previously been visited by one European, namely, Mr. Litton; beyond, as far as  $27^{\circ} 30' N.$ , all was *terra incognita*.

Starting from Pei-pa on November 2, and passing through the

Cheng-ka paddy-fields, we descended by a rough track through uninhabited and almost uncultivated country to the ruined guard-house of No-li-ka (7 miles), and then a scramble through high grass and jungle brought us down to the mid-day halt at a sandy bay by the waters of the Salwin, which here flows at an altitude of 3400 feet; the altitude at the suspension bridge, lat.  $25^{\circ}$  N., is 2700 feet; a little south of lat.  $27^{\circ}$  N. it is 4000 feet; while at Kion-ra, in lat.  $28^{\circ}$  N., Père Genestier of Tsakou gives it as 4900 feet. In this section of its course the Salwin at low water varies from 90 to 130 yards in breadth, and is of great depth. There are no falls, but between  $26^{\circ} 15'$  N. and  $27^{\circ}$  N. there are constant rapids, at some of which the river is contracted to 80 yards. The volume of water in the rains is enormous; we found unmistakable signs of the river having risen, in August, 1905, over 40 feet above its November level. In the fine season the water is intensely cold. From a point above  $27^{\circ} 30'$  N. down to Teng-keng, the river is confined, not indeed between precipices, but between a series of steep ridges falling down in endless succession both from the Mekong and the Irawadi divides to the Salwin. In many places these ridges have a final sheer drop to the river of 500 to 1000 feet, so steep that it is impossible to pass along their base.

The upper Salwin in its course through North-Western Yunnan resembles the Mekong; firstly, in that its course is quite free from the great bends which characterize the Chin-aha, or upper Yang-tzū; secondly, in receiving no tributary beyond a few mountain torrents, the reason of this being, of course, the extreme narrowness of the Salwin basin. At lat.  $26^{\circ} 30'$  N. an air-line of 18 miles would join the east and west limits of the basin, while in lat.  $26^{\circ} 50'$  N. a line of 40 miles would span it and also the basin of the Mekong.

North of lat.  $26^{\circ}$  on the west or Irawadi side of the Salwin, the mountains are exceedingly precipitous, and come down in a series of fantastic, jagged ridges, divided by deep gutters. Altogether, our advance up the river was very slow; even the river-banks, at the few places where we were able to follow them, were encumbered with enormous boulders, piled together like Pelion upon Ossa, rendering progress most difficult. The basis of the rock formation of the upper Salwin is limestone, and the strata of the higher slopes are tipped up so as to point to the sky. There are other evidences of cataclysms and volcanic activity to be found in the boulders strewn along the banks, among which gneiss, marble, and quartz are to be found at every turn. It is said that the Salwin valley is the result of erosion. I think this improbable; but the geology of all this most interesting region demands a competent man of science to describe it.

Animal and bird life along the upper Salwin is conspicuous by its absence—an important matter for the traveller, who cannot count on replenishing his larder with game. On the other hand, the river-banks

at a low altitude, and where wholly sheltered from the north winds, have an almost tropical climate, and vegetable and insect life is both vigorous and troublesome. Creatures with inconveniently long legs plunge suddenly into one's soup; great caterpillars in splendid but poisonous uniforms of long and gaily coloured hairs arrive in one's blankets with the business-like air of a guest who means to stay. Ladybirds and other specimens of Coleoptera drop off the jungle down one's neck, whilst other undesirables insert themselves under one's nether garments. The light in the tent attracts a perfect army of creatures which creep, buzz, fly, crawl, and sting. Scissor insects make the day hideous with their strident call, and the proximity of Lissoo coolies introduces other strangers, of which *Pulex irritans* is by far the least noxious. The mere act of walking in this country is a work of much physical exertion. The villages under the Chinese chiefs have a laudable custom of cutting out their roads every year after getting in their harvest, but in the country north of Cheng-ka constant feuds between neighbouring villages prevent this useful work; the paths are narrow tracks choked with the luxuriant growth of the previous rains, slippery and lop-sided, and as often as not leading along the brink of a precipice. In some places we had to haul ourselves over boulders by pendant branches, or scramble along the face of cliffs by notches in the rocks, more suitable for monkeys, Lissoos, or other creatures gifted with more prehensile feet than a European.

Poisonous-looking scarlet fruits hang from the overarching jungle; lianas and tree-roots trip up the unwary traveller; if he catches the nearest plant to save himself, the chances are that it is a stinging nettle of the size of a laurel, and poisonous in proportion. In some places, especially around maize-fields, the natives provide a further diversion in the shape of "panji," or hard pieces of sharp-pointed bamboo, which are driven into the ground amongst the grass, and will, if trodden upon, pierce even through a leather boot and deep into the foot. It is only when the traveller, scratched, bruised, and with torn clothes, emerges on to a quiet sandbank by the river, or on to some open terrace high above it, and finds the camp fire lighted, the tents pitched, and a pailful of hot water ready for a bath, that he begins to think that exploring the Salwin is a game worth the candle.

But the scenery of the upper Salwin can never be forgotten by any one who has wondered at it in the rich sunshine which prevails after the autumn rains have given way to the first touch of winter. The great variety of rock formation, the abundant forests and vegetation, and the diversity of light effects between the summits of the ranges (at 10,000 to 13,000 feet) and the abyss in which the river flows produce a vast panorama of ever-changing beauty. In the morning the sun, as it touches the top of the Mekong divide, sends wide shafts of turquoise light down the side gullies to the river, which seems to be transformed

into silver. The pines along the top of the ridges stand out as if limned by the hand of a Japanese artist. In the evening all the wide slopes of the Mekong side are flooded with red and orange lights, which defy photography and would be the despair of a Turner. The traveller whose fortune it has been to explore the great rivers of this our north-east Indian frontier will admit that the Salwin, while it is inhospitable, difficult, and barbarous, far exceeds in natural beauty all the valleys of the sister rivers, the Yang-tzū, the Mekong, or the Irawadi.

Continuing our march from the sandbank below No-li-ka (7 miles from Pei-pa), we toiled up a steep slope to the terrace and village of Shih-chi-dé, 1500 feet above the river; here we had a good reception



BIRD'S-EYE VIEW OF TALIFU CITY, ALTITUDE 6500 FEET, TAKEN FROM THE LOWER SLOPES OF THE TALI SHAN OR TALI MOUNTAIN, ABOUT 1200 FEET ABOVE THE CITY LOOKING EAST.

from the Lissoo, deputations from several villages round about offering us small presents of eggs and rice. Every one seemed to know who Mr. Litton was, and it was evident that the fair treatment which the porters and others employed by the party during the spring had received had been passed along, and had had an excellent effect on the natives of the valley. From Shih-chi-dé northwards the people were clad in the Lissoo style, and few or none could speak Chinese.

On November 5 we continued at about 1500 feet above the river, with a series of limestone peaks to the west on the left of us. On clearing the top of a ridge to enter the gully of Mi-wo, we found ourselves confronted by a deputation of warriors armed with huge crossbows, and

headed by the local "ni pa" (prophet, or medicine man). He produced a paper scrawled over with rude imitations of Chinese characters, and declared that he had received instructions from heaven to go and kill somebody, and that he thought the headman of Cheng-ka was the most suitable person, but he desired our advice. We strongly recommended him to go home and see to the grinding of his maize crop.

Passing the village of Mi-wo in its narrow gully, we ascended open ground to the fields of Tu-mo. All along the road we met a number of warriors hastening to follow the prophet to Cheng-ka, but they were far from wishing to molest us; indeed, several of them left the war-path to escort us on our way, and, after seeing a twelve-shot repeating Winchester rifle fired, desired our alliance and assistance in the projected raid on Cheng-ka.

After leaving our bellicose friends at Tu-mo, we crossed another gully to Hsia-ku-dé, a large village for this country, consisting of some forty houses of the true Lissoo type, constructed of rough logs and bamboo matting, raised on piles, with one room only, and a tumble-down verandah. A stone hearth occupies the middle of the room or house, and round this the family eat and sleep. The headman of Hsia-ku-dé was a typical old Lissoo, tall and thin, with a close-shaven grey head, bleary eyes, an aquiline nose, huge earrings of silver and cornelian, and a profusion of bracelets and beads hung about his person and over his dirty hempen clothes. He explained to us his grievances against the Lao-wa chiefs, and gave us a present of eggs and honey. Some young men of the village gave up their expedition to Cheng-ka to join us in our journey up the river.

North of the open slopes of Hsia-ku-dé cliffs block progress by the river-bank. Bearing west of north away from the Salwin, we marched by an unusually good path past the village of Ta-wo-dé, where again the people turned out to offer presents, and, reaching the top of a rise at 6500 feet, we looked across a precipitous valley to the peak of Yako. This is a great tooth of limestone, 9400 feet high, rising sheer from the river-bank. It forms a conspicuous landmark as far off as Mao-chao. At its south base flows a considerable mountain stream, to which we had to descend by a breakneck track from Ta-wo-dé. The slopes of the descent were clad with masses of the trailing *Crawfordia* referred to above.

We crossed the Yako stream at 4500 feet, a descent of 2000 feet from Ta-wo-dé, by a rickety bridge, consisting of a single undressed sapling thrown across, slung on strips of cane, with a banister of pieces of liana. Then a climb by a rude ladder up the face of a cliff brought us to the half-dozen houses which formed the village of Yako. This march was through country wild in the extreme, the lower slopes of the hills being covered with long grass, while above towered an immense

variety of limestone crags and peaks, rising up toward the Irawadi divide.

On November 7 we marched up from Yako village through a forest rich in orchids, and so over the Yako ridge (2 miles) by a pass 7500 feet high some 4 miles west of the Yako peak; from this point we eagerly scanned the country to the north, but it appeared even more difficult and mountainous than what we had traversed, and promised exceedingly slow progress. Just below, and to the north of the Yako pass, is an open horseshoe-shaped stretch of irrigated and cultivated land, about which is scattered the friendly village of Ma-pu-lai-dé. From the village we made another very steep descent through scrub to the wretched hamlet of Ta-cha-dé. Though the harvest had only recently been gathered in, nothing but a little Indian corn was to be bought at any of those villages.

Ta-cha-dé is the limit of the jurisdiction claimed by the Lao-wo chief, though, in point of fact, he has not for many years been able to gather any tribute north of Cheng-ka. While we called the midday halt at Ta-cha-dé, we asked the villagers concerning some new graves which we noticed in a field close by. They answered, "Our headman and two others were killed three months ago in a feud with a village higher up the hills." "Is it settled now?" "Yes." "Did you report the matter to Lao-wo?" "No. What would have been the use? We just settled the matter ourselves." "How?" "Oh, we killed eight of the other party."

Beyond Ta-cha-dé the path appeared to lead up a ridge even more precipitous than that of Yako; we therefore resolved to descend again to the river and try our fortune along its banks or in the bed; a rough track brought us steeply down to a good camp on a sandbank by the river at 3500 feet, 1400 feet below Ta-cha-dé, where a beautiful species of crinum bloomed in masses amongst the boulders, and lofty cliffs and jungly slopes sheltered us from the wind.

The next day's march was one long scramble along and over the piles of gigantic boulders which litter the river-bank and bed. Lofty cliffs shut out the river from view on both sides, and the river was here broken by a succession of foaming rapids. We did not meet a soul all day, and only noticed one small village on the opposite side of the river.

In the afternoon we made our way by a slippery and difficult path along a steep slope to an open meadow some 150 feet down the river, where five wretched huts constituted the village of Ku-tou-wa-dé. The inhabitants, a few women and youths, hid themselves on our approach, but soon became reassured, and told us that the adult male inhabitants had been exterminated by famine and feuds. Neither here nor at the main village higher up the hill was it possible to buy a pound of cereal food.

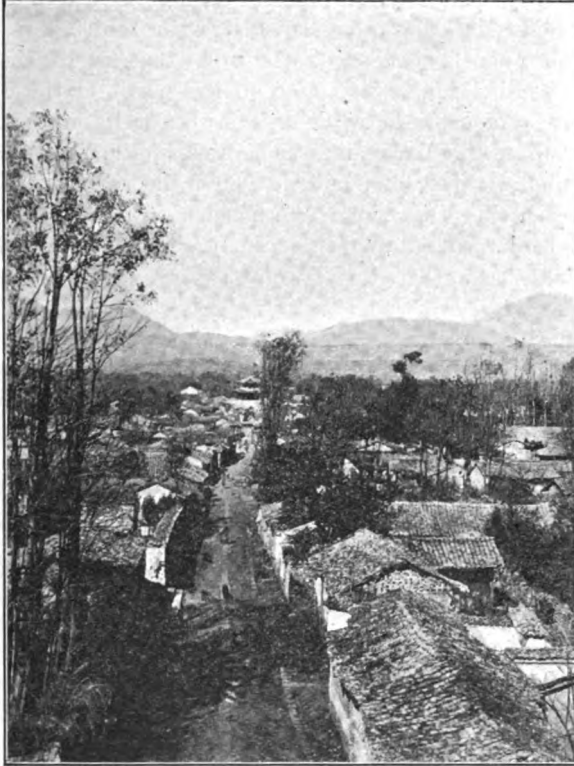
Ku-tou-wa-dé occupies an unusual site close to the river-bank and not high above it, because there is a single-rope bridge across the Salwin at this point. These single rope bridges of the upper Salwin are far more difficult to cross than the double ropes of the Mekong, by which the passenger always starts from a higher level than that at which he lands on the other side, and is thus rapidly carried across by his own weight and with little or no exertion. On a single-rope bridge, however, after having been trussed by cords on to a runner, it is necessary to haul one's self across hand over hand; as one is tied with face to the sky and back to the water, this is a difficult operation. As the Salwin ropes are made of very roughly twisted cane, there is always the chance that the whole affair will break in the middle, and the certainty in any case that one will arrive on the opposite side with hands full of painful splinters off the rope.

Since leaving Hsia-ku-dé we found that the country increased in wildness every march, and the inhabitants in squalor, poverty, and barbarism. Every village which we passed gave us terrifying accounts of the ferocity and savagery of the next, where we would infallibly have our throats cut, etc., etc. On the lower Salwin we had heard stories of people on the upper river who never attempted to wash, and who smeared their faces with grease and filth; this was perfectly true of the Ku-tou-wa-dé inhabitants and those to the north of that place.

The food question, however, was the most difficult for us to solve, and on November 9 we stopped at the considerable village of La-tou-wa-dé (4500 feet) to endeavour to raise supplies. Here all the people, men, women, and children, were dressed in hempen garments of pure Lissoo style; none of them spoke a word of Chinese or acknowledged any sort of Chinese or other authority. They had not even a headman of their own. They were, however, willing to trade, and suggested that Mr. Litton and I should barter our breeches for a bag of rice, but, as we had only one pair in serviceable condition, we could not accede; but a Chinese coolie who was with us did a deal with one of his ragged and lousy jackets, which he bartered for some maize and salt. Cloth was the object in greatest demand, but unluckily we had none to spare; therefore one skinny chicken, a few pounds of bad rice and maize, and two bamboo tubes full of honey, were all we could get from this village of thirty houses, and even this purchase upset the local market.

Beyond La-tou-wa-dé the country became wilder at every step. We were able to do a good long march of 11 miles, mostly along the river, here broken by many rapids, and under beetling cliffs to an opening in the mountains, where above some paddy fields is situated the picturesque village of Chong-wa. The few inhabitants fled at our approach, but we gradually coaxed some of the bolder spirits back to our camp; we found they had feuds with all their neighbours, and were afraid to guide us a mile in any direction, unless we were anxious to attempt a little-

frequented pass, which they declared led up from their village in three days' march to some friendly Lissoo villages on the other side of the Irawadi divide. Our chief object, however, was to reach a point farther north, whence it would be possible to get an extensive view further up the Salwin, and thus discover the general geographical features of the country. The river-bank was impassable on account of cliffs after Chong-wa; therefore, on November 11, we had to climb a steep ridge of 1200 feet, past the village of Ta-chua-ssü, where the



VIEW OF CITY OF TENG-YUEH, LOOKING WEST FROM THE INNER WALL ABOVE THE EAST GATE.

people at first took to their heels, but soon became reassured and offered us the welcome present of a fowl.

From the top of this ridge we continued our march through exceedingly wild country, without any cultivation, until, after 6 miles, we again reached the river-side for the midday halt, amid a tangled maze of grass and jungle plants. The vegetation in that part of the country is almost as great a nuisance as the insects. Every sort of seed attaches itself to one's person; some are provided with hooks, others

with natural gum, others pierce the skin or work down under one's socks. An hour's march leaves the traveller caked with the seeds of enough plants to form the material of a work on the methods of the natural dispersal of flora.

One afternoon of very difficult and even dangerous cliff-climbing brought us to a few wretched huts dignified by the name, as a village, of Niu-ku-ssü, and here we heard certain news of the existence of a rope bridge across the Salwin a few miles farther on.

Camping in a gully beyond Niu-ku-ssü, 9 miles from Chong-wa, for the night, early next day, November 12, we reached a flat marshy unhealthy plain by the river, covered with rank grass, poisonous creepers, and huge specimens of a shrubby species of *Urtica*. This plain, some 4 miles long, was closed to the north by the conspicuous hog's-back ridge of Ju-tu-lo, while to the west of it, on the hill slopes which rose up to the Irawadi divide, was another scattered village. It was an undesirable camp, but we found the single rope by which we could reach the other side. We decided to cross the whole party to the left bank, where, we were told, the villages were larger and more civilized, and that there were passes eastwards over to the Mekong. Luckily, we found a native of the important village of Lo-ma-di on the left bank, returning home from the right bank, and he at once volunteered, in consideration of a bead necklace, to fetch his comrades with the ropes and runners necessary for crossing our party, which consisted in all of thirty-five persons and a dog. Meanwhile the people of the village on the right bank, where we were camped, had heard of our arrival, and came down to see us, and a wild lot they were. It then appeared that there was a feud about this rope bridge between the two villages on the right and left banks respectively, each party claiming that the right and profit of assisting travellers across belonged to them alone. We offered to give an equal present to both parties, but when our friends from the left bank returned with the runners, we saw at once we were in for a serious disturbance. The right-bank party was led by a bullying savage, who shouted that the left-bank party should not help us across. The lefts had rashly left their arms on the other side, but proceeded to tie up one of our loads for the passage; whereupon the leader of the rights whipped out a poisoned arrow and shot it from his bow, over our heads, into the river—a sign, like Mr. Snodgrass taking off his coat, that he was about to begin. As we were all crowded together on a narrow path, near a tree to which the rope bridge was secured, and the bellicose Lissou was about to draw his bow again with an arrow in it which might find a billet in the body of any of us, the situation was critical. Mr. Litton and I at once rushed him, and I fired several shots from my Winchester repeater over his head at a boulder on the other side of the river. The effect of seeing the bullets smash against the stone at such a distance

was immediate, and then, through our interpreters, we told the man and his friends that, if they made a show of stringing their bows again, the next bullet would find a resting-place in some of their carcasses. They had little or no idea of firearms, especially of weapons of precision, and they at once subsided into an awe-struck silence; but still we had to stand on guard, and at intervals give exhibitions of our marksmanship and the power of our weapons, till all our party had been safely hauled across the rope to a sandbank on the opposite side,



NATIVE OF THE SALWIN VALLEY.

where we pitched camp together with our friends from Lo-ma-di, who expatiated on the savagery of the low people who lived on the right bank, congratulated us on the manner in which they had been suppressed, and promised us a hearty reception at their own village next day.

Early the next morning, November 13, we ascended steeply from the river through carefully cultivated patches of maize, millet, and buckwheat to 6500 feet, when we came on the elaborately terraced ricefields of Lo-ma-di. Our friends of the previous day and a number of their

friends were now with us, and, though all armed to the teeth, were most amiable and childishly delighted with our firearms, our clothes, and the pointer dog.

What was most interesting to us was an extensive view which we obtained from a small plateau in the midst of the paddy fields, looking straight north up the funnel-like valley of the Salwin. As far as the eye could reach, which was as far as lat.  $27^{\circ} 40' N.$ , we at the time being in about lat.  $26^{\circ} 55' N.$ , we could trace the almost direct north-and-south course of the river, and the succession of ridges falling down from the high ranges to the river from the east and west divides, in a manner so regular as to suggest the ribs of a vast skeleton. This view showed conclusively that there is no plain or open valley in this section of the Salwin, as was supposed, and that the character of the country for a long distance to the north of us was the same as that through which we had just passed.

From the paddy fields we ascended to the village of Lo-ma-di, by far the largest, cleanest, and best-built Lissoo village we had yet seen; some ninety households were scattered along a broad slope at an altitude of 6500 feet, looking down on the Salwin, more than 2000 feet below. Groves of pine and fruit trees gave grateful shade, and the little garden plots were divided by neat bamboo fences. The picturesque inhabitants, with their beads, cowries, silver ornaments, and long hempen garments, came out *en masse* to welcome us, and several of the village elders brought trays of rice, eggs, vegetables, etc., which they offered on their knees. We found several Chinese-Minchia traders from the Mekong; they bring cotton cloth, opium, salt, and goats, which they exchange for local produce, the staple being a varnish, produced by tapping a varnish tree similar to one which Mr. Litton says is well known in the province of Kwei-chou. Beeswax, some drugs, and a small supply of gold dust are also exchanged. Trade with the Lissoo, we were told, is a profitable but risky matter, as there is no sort of government in the country, and even the comparatively civilized tribes on the left bank of the Salwin are continuously fighting amongst themselves.

The attentions of the crowd at Lo-ma-di became so embarrassing that we resolved to push on into the mountains. Marching south-east by an excellent path through oak scrub, we halted for the midday meal at the hamlet of Ji-Ji, situated at 7200 feet on an open shoulder of a wide ridge commanding extensive views down the mountain ranges to the south.

The men of Ji-Ji were at war with their neighbours, and, indeed, we watched the progress of the fight during our tiffin. The *causa teterrima* was the theft of some "pao-ku," i.e. maize, and a whole army corps, consisting of some fifty warriors, had been mobilized. These fellows, with their grotesque ornaments of silver, deers' horns, pebbles, and cowries, their blackened faces, their flowing hempen robes, their war-bows 5 feet

long, their war-swords 5 feet long, and their broad ox-hide shields 5 feet high, moving in a line beyond their village, presented an image of the "pomp and pride and circumstance" of war. The enemy occupied a position higher up on the hill, and a fierce bombardment of opprobrious epithets was maintained, but neither side got further than swearing and stringing bows until the time arrived for the afternoon meal, when the combatants dispersed to their respective homes, from which we judged their wars resembled those of Tweedledum and Tweedledee, "who felt that they must fight for half an hour, and then have tea."

Ji-Ji was the last village on the path leading up to Mekong-Salwin



GROUP OF MING-KWONG LISSOO, OF THE VILLAGE OF TA-CHU-PA.

divide, which we now determined to cross. On the evening of November 13, we made good way into the mountains, marching along an easy but narrow path through woods, high above a feeder of the Salwin. We met some more traders driving goats down to Lo-ma-di, and we bought the flower of the flock for our dinner at Tls.1.50. Camp was pitched 4 miles from the Salwin, under a large rock overhanging the path, which gave the men some shelter from the damp of the forest, and early the next day we negotiated the pass, November 14.

Crossing the head of the stream above which we had marched the day before, a long and steep but not difficult ascent, through bamboo brake and pines, brought us out on to an open alp at 10,500 feet. Hence a climb by a rocky path brought us up on to a bare wind-swept

cool, which forms the pass at 12,500 feet, 9 miles from camp, 20 miles from the Salwin. Unluckily, mist was being blown along the ridge, and this obscured our view, but several bare limestone peaks were seen, rising 1000 to 2000 feet above the pass. The men were all benumbed by the intense cold, and at the first sheltered spot, some 500 feet below the summit, we lit a roaring fire of bamboos, and enjoyed, so far as the drifting mist allowed us, an immense view of the Lichiang and Tali prefectures beyond the Mekong. In the afternoon we got on to a convenient but steep spur, and made rapid progress down towards the Mekong; we camped in a wood at 9400 feet, near the village of Hou-tzü-ngai (Monkey cliff), after a march of 15 miles. The next day we rested the men at a pleasant camp under pines, near the little village of twenty log huts. We were over 5000 feet above the Mekong, and in latitude  $26^{\circ} 55' N.$ , some 20 to 25 miles north of the Chinese market of Ying-pan on the left or east bank of the river. This is a salt bazaar, and the centre for all the petty trade between the Minchia inhabitants of the Mekong and the wild Lissoo. It would, we thought, be a good place for us to replenish our exhausted commissariat.

From Hou-tzü-ngai we therefore turned south, and found an excellent high-level road, by which, on the afternoon of November 16, after a 25 miles' march, we found ourselves at the mud-built Minchia village of Pu-mu-tou, 7500 feet, from which Ying-pan bazaar could be seen across the river far below us.

The people of Pu-mu-tou, at first apprehensive that we had something to do with the Yamen, soon became friendly, and brought fowls, eggs, and a pig for sale. Some of our Lissoo porters were sent down to the market next day, while we, having observed some paddy fields, varied with patches of scrub, which foreshadowed *Phasianus elegans*, went out to forage with the guns, and secured a welcome addition to our larder of six brace of fine pheasants. Our men came back in the evening not more than reasonably drunk, and laden with supplies. We were therefore in a position again to face the terrors of the foodless Salwin, and the headman of Pu-mu-tou volunteered to guide us up to the divide by a different pass from that by which we had come, on condition that we would not expect him to approach any of the villages of those terrible wild Lissoo.

This part of the upper Mekong differs widely from the Salwin valley in the same latitude. Instead of sharp crags and cliffs of limestone, dense semi-tropical jungles, extensive forests, and wild Lissoos with their poisoned arrows, we viewed a peaceful scene of wide, bare, cultivated slopes of clay or disintegrated sandstone, shelving down in terraces to the river below. The basin of the Mekong at this point is twice the breadth of the Salwin, though the altitude of the latter river is 1000 feet less. The people, like the scenery, are altogether less wild than on the Salwin. The houses of mud brick are built into

village streets, instead of being scattered about over the hillside. Large villages of fifty to a hundred houses occupy all the good sites, where water for rice irrigation is available. In customs, dress, mode of life, in fact, in everything but in language and race, the Minchia are, to all intents and purposes, Chinese. They are too far off from their "father and mother," the Lichiang official, to be troubled much by Yamen underlings, Lichiang being distant eight long mountain stages. They live, if not a strenuous, at least a peaceful and not unprosperous, life, and, being far more industrious in cultivation, and less troubled with clan fights than the Lissos, are less frequently subject to the ravages of famine.

From Pu-mu-tou we ascended a spur, through oak scrub and over grassy slopes, rising in the day's march from 7400 feet to 10,500 feet on the slope towards the Salwin divide. At this altitude there was a superb view of all the great ranges of north-western Yunnan east of the Mekong, from Talifu to the borders of Tibet. Most of these north-western Yunnan panoramas are dominated by the glittering snow-mountain of Lichiang; and from the altitude we had reached, Mr. Litton saw, for the first time, the peak which I described to him after my return from my journey down the Chung-tien plateau. He estimated the height as being very near what I put it down as, 22,000 feet. It forms the end of that part of the Lichiang range which extends up the eastern side of the plateau to the north of the Yang-tzū river. It is unknown and unmapped.

After an intensely cold night on the mountain-side at 10,500 feet, we proceeded, on November 19, up the pass, which for the first time was traversed by European feet. The path, after topping a spur, lay through pine woods deep in snow, and then over a frozen black marsh surrounded by tall sombre firs, whose dark green foliage stood out against the snowy slopes of the pass and the deep blue sky above. Then an ascent through rhododendron scrub, and over a bare down, where we passed a number of wild Lissos going down to the Mekong to barter for salt, brought us to the summit of the pass, 12,300 feet.

Here a surprise awaited us, for the view to the west was perfectly clear, and the whole of the great Salwin-Irawadi divide was spread out before us. From a little below the pass this range could be followed to the north as far as the eye could reach, until, at a distance of about 100 miles from where we stood, and in approximate lat.  $28^{\circ} 30' N.$ , it was merged in a huge range of dazzling snow-peaks, trending westwards. This range is doubtless the east source of the Irawadi, and forms the divide between it and the Zayal, the Bramaputra system. The upper slopes of the Salwin-Irawadi divide, which we saw spread out before us, resemble a vast wall. The trend of the range is most regular from north to south, and there are no very conspicuous peaks. The average height of the summits in this latitude,  $26^{\circ} 55' N.$ , would be

probably 12,500 to 13,000 feet. There was practically no snow on it in November.

Below the wall-like ridge which forms the backbone of the range, limestone spurs, crags, and precipices in bewildering confusion fall down to the Salwin. It was easy to see why the upper slopes of the range are uninhabited, and why this mountain barrier is an ethnographical boundary between the Lissoo and Kachin races.

On this pass, as at many other places on our journey, we saw several mouldering skeletons by the sides of the pathways, victims either of the famine of the previous season, or of a savage temper and a cross-bow. The Lissoo have a superstitious terror of human remains, and give them a wide berth. In the afternoon, after crossing the pass, we made good way along the top of a well-defined winding spur which rose up from the Salwin. Descending to 8600 feet, we camped at the small Lissoo village of Lu-po, from which place the pass derives its name, after a march of 15 miles. At Lu-po the people gave us alarming news—there had been fighting down the river; 3000 Chinese troops had come from Cheng-ka and slaughtered the Lissoo; one man had seen with his own eyes fifty corpses laid out by the Salwin; all the ropes across the river were cut, and so on, and so on. The next day, November 20, when, by a breakneck descent on a slippery declivity, we reached the Salwin at 7000 feet, near the village of U-a-lo, we found that three of its enterprising inhabitants had just made a rude raft of bamboos, loosely tied together, and were prepared to take our party across. As the *ship* could only carry two men and two loads in a journey, and as the Lissoo do not shine as watermen, while the current at this point is strong, the crossing was not completed by nightfall. By the camp fire the natives made our flesh creep with further accounts of sanguinary battles down the river. When, however, we found on the next day that the rope bridge at our old camp of Ku-tou-wa-dé was just as we had left it, we rightly attributed the 3000 soldiers to Lissoo imagination. What was more alarming was the serious inroads of fever among our little party, exhausted by the labours of a flying march; two very bad cases had to be carried on the backs of two of our coolies, and our stock of drugs was soon exhausted. Luckily, we got through without the loss of a single life, and by forced marches returned to the base camp near Lu-chang on December 1, in good spirits, if in ragged clothes.

We ultimately discovered the truth of the disorders at Cheng-ka. It appeared that our friend the prophet at Mi-wo, whom we had met on the warpath on our way up the Salwin, had not taken our advice to go home and pound his maize. A number of the young men of Mi-wo, Hsia-ku-dé, and the surrounding villages, some of whom had escorted us and endeavoured to inveigle us into an entangling alliance, finding "in these hot days the mad blood stirring," had raided the

Cheng-ka paddy plains, with a view of capturing the Sawbwa's uncle, who, however, escaped in time across the Salwin. The raiders thereupon speared one of his poor relatives, and—a far more serious offence—broke into the princely piggeries and did bloody execution on the porkers therein. They then camped and celebrated a Homeric feast. The Lao-wo chief, hearing of the horrid disaster which had befallen his uncle's pigs, hastened across the Salwin, and the neighbouring headman of Lu-k'u and Mao-chao also came to the rescue. It appears that the raiders were caught drunk, and three or four killed, while the rest dispersed. Finally, the unusually energetic Yung Lung official (sub-prefect) from beyond the Mekong, seven mountainous stages



VILLAGE OF TA-CHU-PA IN THE MING-KWONG VALLEY.

distant, hurried on the scene with a dozen men, the nucleus of the 3000 of whom we had heard, and took up a defensive position at Cheng-ka. The news of this so alarmed the Hsia-ku-dé and Mi-wo folks that they deserted their villages and fled north into the mountains, while the Cheng-ka people showed equal alacrity in running away in a southerly direction. Thus, when we reached Cheng-ka, we found the genial Yung Lung mandarin and his attendant chiefs in sole possession of the stricken field.

Similar disturbances have been of frequent occurrence, and are due to the squeezing attempted by Lao-wo on the Mi-wo and Hsia-ku-ti group of villages, which Lao-wo claims, but which do not recognize his authority. Lao-wo endeavoured to levy double tribute from Hsia-

ku-dé, whereupon the Hsia-ku-dé headman lifted twelve of Lao-wo's cattle. Lao-wo retaliated by kidnapping the headman's son and seizing his salt. Then the prophet began hearing noises, and even a prophetess appeared near Hsia-ku-dé. We ourselves had dealings with this dirty Cassandra; she conferred on us a small pig and a charm, in return for eight two-anna pieces and a silver bangle. Thus the trouble grew, after the usual manner of a frontier case where there are no British officers to settle it.

Before returning from Cheng-ka to Teng-yueh, we had, on November 26, moved camp to 9200 feet, up a grassy ridge above Pei-pa village, with the view of exploring a pass which leads over the Irawadi divide at this point. From our camp above Pei-pa we toiled up some steep slopes, which were clothed with large patches of virgin forest and bamboo brake, varied by grassy downs.

On reaching 11,000 feet, we saw before us the bare wall of limestone crags which forms the Irawadi divide, but, as usual in the complicated formation of this range, the ridge up which we had climbed did not go straight to the top, but turned off in a northerly direction, being cut off by a stream from the main range. The track followed a line parallel to the divide; it was a mere goat-path, and very difficult in places where it crossed some slippery cliffs. After a long march of five and a half hours from camp, or eight and a half from Pei-pa, we plunged into a pine forest, thence into a bamboo brake, and crossed the stream which divided us from the final arête, a stony upland leading to a col of 13,000 feet between two lofty crags of limestone. This pass above Pei-pa is uninhabited, and only used by a few scattered Lissoo householders living on the upper part of the Irawadi slope, and occasionally by salt porters. It is too wild and difficult to be a regular line of communication even for a coolie traffic. It is called the Chi-mi-li pass.

Having concluded this final bit of exploration, we returned without mishap to Teng-yueh, which we reached on December 13.

#### REMARKS ON THE LISSOO TRIBE OF THE UPPER SALWIN.

The Lissoo race, if not powerful or very numerous, occupies a large tract of territory. The tribe is undoubtedly an offshoot from the south-east of Tibet, probably an ancient offshoot established along the upper Salwin and upper Mekong before the introduction of Buddhism into Tibet. None of the Lissoo, even those who live among or near Tibetans, show the least trace of Buddhist influence or belief. Mr. Litton says their religious practices closely resemble those of the Kachins, who believe in numerous "nats" or spirits which cause various calamities, such as sickness, failure of crops, etc., unless propitiated in the most suitable manner. The most important spirit is the ancestral ghost. Lissoo graves are generally in the fields near the villages; over them is put the crossbow, rice-bags, and other articles used by the deceased. It

is probably from foundations such as these that the fabric of Chinese ancestor worship was constructed. Food is also placed on the grave for many days. The upper part of the structure is a roughly hewn board, of the shape, but larger than, a coffin-lid, to protect the articles hanging on the upright post from the weather.

The Lissoo are believed to be allied to the Lo-lo tribes which inhabit Yunnan and part of Sechuen. A Tibetan origin is assigned both to the Lo-lo and the Lissoo; and in their tall bony physique, high cheek-bones, and sepia colour, the two tribes certainly resemble one another. There is also a striking similarity in the languages, which can hardly be accounted for save on the theory of common race.

The Lissoo may be said to form practically the whole population of the Salwin valley from  $27^{\circ} 30'$  to  $26^{\circ}$  N. They have spread in considerable numbers along the mountains between the Shweli and the Irawadi, and in isolated groups far away down the Burmese frontier, and, I am told, into the Shan States. They occupy the upper slopes of the Salwin-Mekong and Mekong-Yang-tzu divides in the Wei-hsi-ting district, and are found sporadically even to the east of Lichiang fu. Under British rule they have been found readily amenable to civilization, and are more docile than the Kachins. But those whom we saw on the upper Salwin north of Hsia-ku-dé were utter savages. Up to and including Cheng-ka in lat.  $26^{\circ} 12'$  N., the Lissoo who are nominally controlled by Chinese chiefs are quiet and friendly enough. Then there is the Hsia-ku-dé group of villages under their headman, but not recognizing any Chinese authority, and resisting any attempt of the Chinese chiefs to exercise it. From Yako northwards up to the limits of the Lissoo country, about  $27^{\circ} 35'$  N., there is no sort of government or control of any sort or kind, by any Chinese or other chief. Most of the villages have not even a regular headman; nearly every village, too, speaks a dialect, and two Lissoo sepoys from the Burmese frontier below Teng-yueh, whom we had with us, could not make themselves understood beyond lat.  $26^{\circ} 30'$  N. There are also a number of tribal subdivisions, a source of constant feuds. The Chinese official theory that the country belongs to the hereditary Minchia chief Lo, who resides at Tu-wo, lat.  $26^{\circ} 8'$  N. on the Mekong, has no foundation whatever; in fact, on the contrary, no sort of official person would dare to go anywhere near the country.

The villages are nearly all at war with one another; few of the people have ever in their lives been more than a day's journey from their own huts; suspicion, rumour, and terror sit enthroned among those limestone ridges. It is almost impossible to get a guide, and quite impossible to get any accurate information about routes, distances, and such-like details. None of those wild Lissoo ever seem to have asked whence the river Salwin, which occupies so large a place in their lives, comes or whither it goes, or what is at the back of the great

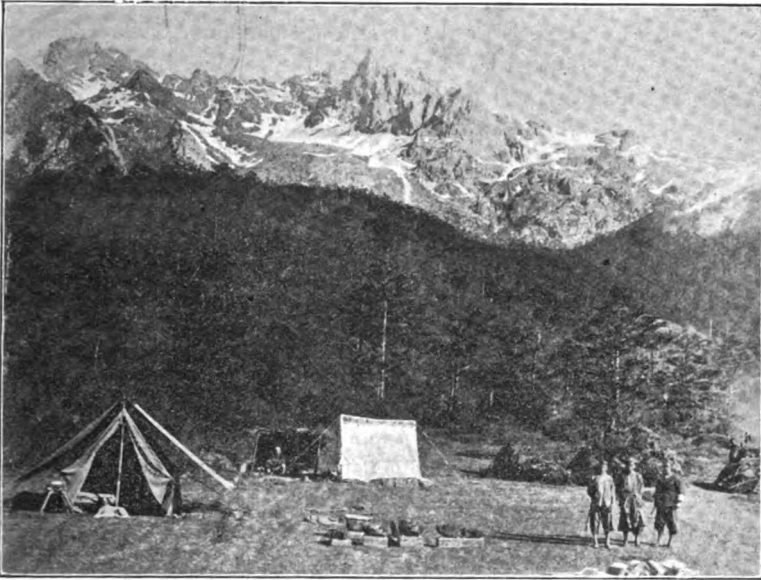
ranges which confine their view of the world. The object of each little community seems to be to keep its neighbours at a distance. The people are also exceedingly lazy; in the spring they do a few days' work in scraping a patch of soil, just large enough to yield subsistence, and in planting their maize; then in early October they put in a few days' more work, getting in their crop and cutting their hemp, or looking after their tobacco patch. All the rest of their lives is spent in eating, sleeping, and squatting round the hearth, varied by a rare expedition to get wood for a crossbow, poison for their arrows, or a stock of salt or wild honey. Under these conditions it is not surprising that, in spite of the sparseness of the population and the great extent of land suitable for maize and other cultivation, famine is of frequent occurrence.

Rice is a luxury; coarsely ground maize, buckwheat, and wild honey are the staple food of the people. When we passed along there were practically no domestic animals or fowls, as they had all been killed during the famine of the previous season. Wild honey as a change is an agreeable sweetmeat, but after a few days' constantly partaking of it, the European palate rejects it as nauseous and almost disgusting; it has escaped the Biblical commentators that one of the principal hardships which John the Baptist must have undergone was his diet of wild honey.

A draughty hut of rickety logs and bamboo matting, consisting of one room, in length 15 to 20 feet, and in breadth 6 to 8 feet, the whole raised 3 to 4 feet above the ground on piles, and provided with a verandah, and a stone hearth in the middle of the floor—such is the true Lissoo hut. The roof is thatched with grass. A large iron pot, a few wooden bins or bamboo baskets to hold grain, and some bamboo tubes to hold water, with occasionally a few rude stools and a rude loom for weaving their hempen garments—such is the furniture which supplies the Lissoo in his simple life.

If I had to suggest a title for a book on the upper Salwin I should call it "The Land of the Crossbow," which is the characteristic weapon of the country and the Lissoo tribe. Every Lissoo with any pretensions to *chic* possesses at least two of these weapons—one for everyday use in hunting, the other for war. The little children play with miniature crossbows. The men never leave their huts for any purpose whatever without their crossbows; when they go to sleep the "nu-kung" is hung over their heads, and when they die it is hung over their graves. The largest crossbows have a span of fully 5 feet, and require a pull of fully 35 lbs. to string them. The bow is made of a species of wild mulberry of great toughness and flexibility; the stock, some 4 feet long in the war-bows, is usually of wild plum wood; the string is of plaited hemp and the trigger of bone. The arrow, of 16 to 18 inches, is of split bamboo, about four times the thickness of an ordinary knitting-kneedle,

hardened and pointed; the actual point is bare for a quarter to one-third of an inch, then for fully an inch the arrow is stripped to half its thickness, and on this portion the poison is placed. The poison used is invariably a decoction expressed from the tubers of a species of aconitum, which grows on those ranges at an altitude of 8000 to 10,000 feet. The poison is mixed with resin, or some vegetable gum, to the consistency of putty, and is then smeared on the notched point. The "feather" is supplied by a strip of bamboo leaf folded into a triangular form and tied in a notch at the end of the arrow with the point of the angle outwards. The reduction in thickness of the arrow where the poison is placed causes the point to break off in the body of any one whom it



PANORAMIC VIEW OF THE LICHANG RANGE, TAKEN FROM THE LOWER SLOPE OF THE EASTERN FLANK LOOKING WEST, ALTITUDE 11,000-12,000 FEET.

strikes, and as each carries enough poison to kill a cart-horse, a wound is invariably fatal. Free and immediate incision is the usual remedy when wounded on a limb or fleshy part of the body; but at Cheng-ka the uncle of the Lao-wo chief showed us a preparation which resembled opium dross, and which he said was an effective antidote. Its nature and preparation is a secret known only to the "prophets." We saw one man at Cheng-ka who had been wounded through the fleshy part of the arm in the recent fighting, and through the use of the remedy had quite recovered, but in its passage the head of the arrow had not broken off.

The marvellous Chinese stories which one hears about the Lissou

have to be taken with a good deal of salt. The Lissou are not a fighting people, and, with few exceptions, seemed to us to be arrant cowards, but the crossbow and poisoned arrow is certainly a most diabolical weapon. An arrow from a war-bow will pierce a deal board an inch thick at 70 to 80 yards; some of the Tsakou natives (my servants in the Mekong valley in 1904-5) were so expert that they could hit a mark, 4 inches in diameter, repeatedly at 60 to 80 yards. As no one goes anywhere without his crossbow and his bearskin quiver full of those poisoned arrows, and as every village is at feud with every other, mutual suspicion, of a nature to absolutely prevent social intercourse, is inevitable. In open fight the Lissou are usually careful to keep at a respectable distance from each other and behind ox-hide shields, which protect the whole of the body. But if battle is rare, murder and sudden death by ambush in the jungle are common. The Lissou has all the lack of self-control which marks the savage, and it is so easy to bend down, string a bow, and send an arrow into any one with whom one has a difference of opinion. I can recommend any traveller who falls in with a tipsy or bellicose Lissou with a crossbow, to shoot first and argue afterwards. The first step in civilizing these people would be to deprive them of their horrible machines.

The wild Lissou are much addicted to strong drink; they make a fermented, not a distilled liquor out of millet or maize, which resembles strong Japanese *saké*. They are so improvident that they commonly use for wine grain which is required for food.

There is no regular communication up and down the Salwin. A few petty traders go from Cheng-ka to the villages near; others, greatly daring, go from Ying-pan-kai, on the Mekong, westwards into the wild country along the Salwin. Further north from A-wa, lat.  $27^{\circ} 20' N.$ , on the right bank of the Mekong, and from the Ha-lo ferry on the Mekong near A-wa, an important pass leads over to the Salwin, which it strikes at about lat.  $27^{\circ} 35' N.$ , at a village called Ta-su. This country is mainly inhabited by Lu-tzu, a tribe quite distinct from the Lissou, and probably connected with the Mishmi or Kachin races. From La-tsa, lat.  $27^{\circ} 36' N.$ , northwards for some distance, the Salwin valley is far opener than in the wild Lissou section, part of which we explored. La-tsa is also the southern limit of the somewhat vague authority exercised or claimed by the Yeh-chih chief on the Mekong. Chinese agents of a trading firm at A-wa and Wei-hai-ting are already established at La-tsa and Ta-su, which they make a base for petty trading ventures westwards into the upper Irawadi basin, the Ch'in country.

As regards the wild Lissou, we were able to lift a corner of the curtain which has hidden them hitherto from the outer world, and I think they may in future be safely left to enjoy, in obscurity, their dirt, their fever, their limestone ridges, their poisoned arrows, and their wild honey.

Before the paper, the President said : The paper which is to be read to-night deals with the only portion of the Salwin river which remained untraversed by Europeans when, in December, 1905, Mr. Litton and Mr. Forrest set out on their expedition. Mr. Litton on his return to England died, and that is the sad reason why we are not on this occasion able to congratulate him on this expedition, and on his previous expedition in Yunnan and Burma. Unfortunately, also, Mr. Forrest is absent, though not, I am glad to say, for reasons of ill health. In these circumstances, our honorary secretary, Major Close, has very kindly consented to read the paper, and I will therefore ask him, without more ado, to be kind enough to proceed with the reading.

After the paper, the President : This paper deals with such a very out-of-the-way place, and Major Close seems to be the only person present who has ever visited the Salwin. It is, therefore, somewhat difficult to get up a discussion. I believe that every great river throughout the world is now more or less known, and that the Salwin was the last great problem that had to be solved. It is one of the sad things about exploration of this sort that it destroys that fascinating pleasure that geographers had of attempting to fill up the great blank places on our map, by tracing the courses of rivers across them, and I think we forget sometimes how short a time ago it is since the last of these problems had to be solved ; for it was not known until the year 1885 whether the upper waters of the Brahmaputra fell into the Brahmaputra or into the Irawadi, and that, of course, was a very primary problem in the geography of this district. This problem was set at rest by the traveller A. K. in 1885, although it ought to have been solved long ago by the explorations of the Abbé Kircher, the accounts of whose travels had been overlooked and forgotten for many years. In 1885 it still remained doubtful whether the Loo river in Tibet emptied its waters into the Salwin, and it is only twenty-one years ago since your President from this chair maintained the mistaken hypothesis that this Loo river emptied itself into the Irawadi. That problem was completely solved in 1896 by the explorations of Prince Henry of Orleans, and I am very glad to be able to mention the name of that distinguished French geographer in the presence of a number of distinguished French geographers who are here present to-night. Prince Henry of Orleans passed the Salwin river in one or two places, but between about 26° and 28° N. lat. there was a considerable portion of the river which he had not traversed. The paper we have heard to-night fills up this gap, and we may say now that the whole course of this river is fairly well known. I cannot help regretting the absence of Mr. Forrest, because I think there are one or two points on which he might have enlightened us in an interesting way. He speaks of seeing mountains as some 22,000 feet high, and I cannot help thinking this points to some considerable want of geographical knowledge on our part, and to some further field of research of a very interesting character. Then, again, he speaks of the bed of the Salwin river as not having been excavated by denudation. While this extraordinary arrangement of rivers running parallel to each other in narrow valleys for so many miles does appear to be due to some general cause affecting the surface of the Earth, I have no doubt each valley must have been excavated by denudation. This opens out a very large geographical or geological problem, and one which is worthy of study. Apparently the Salwin river is deeper than either of the rivers on either side of it. Well, this, so far as I see, points to the effect of denudation, and therefore to the basin of the Salwin being longer than the basins of either of the other two rivers. This fact ought to have solved the problem as to the Loo river being really the upper waters of the Salwin, because, the river being deeper, it would point to this being the most important river of the three. I think it is likely to be one of the last regions of the world to

be civilized. One can hardly conceive railways or roads traversing these regions from east to west, and the lines north and south along these rivers are not the natural routes for trade, and therefore there seems no reason why this country ever should be opened up. We are looking on scenes which are likely to remain the same for many, many years to come. I think you will like me, in your name, to convey to Mr. Forrest the thanks of the Society for the paper he has read to us.

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## RECENT EXPLORATION IN BRITISH NEW GUINEA.\*

### I. JOURNEYS OF MESSRS. BARTON, STRONG, MONCKTON, AND OTHERS.

THE work of British officials in the Territory of Papua, as the British portion of New Guinea is now formally designated, continues to add to our knowledge of the geography of the great island, the broad outlines of which, so far as the narrower eastern extremity is concerned, may now be said to be fairly well ascertained. Accounts of many of their journeys have appeared in the "Annual Reports" issued officially in Australia, and have been referred to from time to time in the *Journal*, though the cartographical results have not always been made generally accessible. In the present number we are enabled to give a map embodying the most important of those results, so far as they relate to the east central parts of the territory, with which most of the recent survey work has been concerned. Among the officers who have been most active in this direction are the present administrator, Capt. F. R. Barton, Mr. C. A. W. Monckton, and Dr. Strong, who have kindly placed their maps at our disposal, while some additional information has been utilised from other sources.

Captain Barton has had many opportunities for survey work during his official connection with the territory, which has now lasted some years. As private secretary to the former administrator, Sir G. R. Le Hunte; as commandant, for a time, of the Armed Native Constabulary; and subsequently as resident magistrate of the Central Division, he made many journeys into the interior, and always paid careful attention to the mapping of the routes. In 1900 he made an important journey, in company with Dr. Blayney, Sir F. Winter, and others, from Cheshunt bay in the south, across the main watershed of eastern New Guinea to the headwaters of the Musa river, which had not then been reached from the northern side.† The country traversed was pacified, and a geographical result was the demonstration that the headstreams of the Musa reach within a comparatively short distance of the south coast, one of them, the Adana, breaking through the high range between

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\* Map, p. 328.

† Annual Report, 1900-01, Appendix H (with map); and *Journal*, vol. 19, p. 95.

Mounts Suckling and Clarence by a deep and narrow valley. A little later, Capt. Barton accompanied Mr. Monckton, then the resident magistrate of the North-eastern Division, on an expedition from Collingwood bay to the upper and middle course of the Musa, across a spur of the imposing Gorupu range, which runs north-east from Mount Suckling.\* This was known as the Doriri Expedition, one of its objects being the pacification of the interior region inhabited by tribes grouped under that name.

Since his appointment as Administrator in 1904, Capt. Barton has continued to do good service to geography during his various visits of inspection to outlying parts of the territory. In September, 1904, he traversed the Northern Division in company with Mr. Monckton, by the newly-made road from Buna to the Upper Yodda gold-field, and thence to the station at Tamata (since moved to Ioma), in the lower Mambare valley.† In December, 1904, he undertook an inland expedition from Port Moresby to the Yodda valley, by way of the "Gap" in the main range just south of 9° S., being met here, by arrangement, by another party of police from the north.‡ The country traversed had not been visited for some years, and the expedition led to valuable results, both from the geographical and administrative points of view, government influence being established over the wild tribes in this direction, and regular communication opened from Port Moresby to the Yodda valley.

As resident magistrate, first of the North-eastern, and afterwards of the Northern Division (and, for a time, of the two together), Mr. Monckton has perhaps covered more ground in his many exploratory journeys than any other official, and it is largely to his labours that our improved knowledge of the interior of those divisions is due. His expedition in April, 1901, to the Doriri country, in conjunction with Captain Barton, has already been referred to. Later on he visited the remarkable tribe of swamp-dwellers—the Agaiambo—inhabiting a tract to the south of Dyke Acland bay. In February, 1903, he was placed in charge of an expedition for the examination of the country along the northern slopes of the Hydrographer's range, with a view to selecting a direct line for a road from the north-east coast to the Yodda gold-field. In this he was accompanied by Mr. Tooth, a professional surveyor. Later in the year he escorted Mr. Christopher Robinson, then Acting Administrator, on a difficult journey from Ketakerua bay (an inlet of Dyke Acland bay) to the Yodda valley.§ During this journey, which led through unknown parts of the Hydrographer's range, some hostilities with the natives occurred, and an outbreak of measles among the carriers added to the difficulties. After reaching Papangi in the

\* Annual Report, 1900-01, App. N (with map); and *Journal*, vol. 21, p. 558.

† Annual Report, 1904-05, p. 4; and *Journal*, vol. 29, p. 91.

‡ Annual Report, 1904-05, p. 7; and *Journal*, *ibid*.

§ Annual Reports, 1902-03, p. 14; 1903-04, pp. 7, 45.

upper Kumusi valley,\* it was found impossible to proceed, and the party returned to the coast *via* the Kumusi. Mr. Monckton seems to have continued his explorations in this region in 1904 and 1905, but the accounts of exploratory work have become more scanty in the later Annual Reports, and no detailed narrative of the various journeys appears to have been printed.

A still more important journey, carried out by Mr. Monckton early in 1906 from Ioma on the Tamata creek to Mount Albert Edward in the main range, is, however, described in the Annual Report for 1905-06 (pp. 85-93, with maps and sketches). The expedition was accompanied by Mr. Money of the Anglican Mission, who gave valuable aid in sketching the physical features of the country, taking photographs, and collecting vocabularies. The route led through a previously unvisited tract beyond the Aikora, the chief headstream of the Gira river, towards which, however, the miners have lately been pushing forward their camps. In the neighbourhood of a camp formed by Messrs. Bruce and Eriksen (who have attained some success in working a terrace claim, and whose treatment of their employes is spoken of in terms of high commendation) small caves full of stalactites and stalagmites had been disclosed, and a number of animals or reptiles, said to resemble lizards with hairy skins, had been washed out. Here the Aikora was about 2000 feet above sea-level, full of rapids and running through steep gorges. Being anxious to visit the Gagara and Kambisa tribes on the Chirima river (a tributary of the Mambare), Mr. Monckton crossed the dividing range, over 9000 feet high. Having reached the villages on the Chirima, he was obliged to send part of his force back for rice, and during his halt spent an anxious time on account of the hostile attitude of the natives. Some interesting information was, however, collected respecting these people and the objects in use among them. Continuing his march up the Chirima valley, Mr. Monckton, on May 5, began the ascent towards Mount Albert Edward by a spur running north of west, and leading to the point where the Wharton chain joins the former mountain. During the ascent the natives suffered severely from cold, and matters were made worse by want of water, but a scanty supply permitted some pea-soup to be served out, which, with chocolate, Mr. Monckton found of much use in similar situations. On the 6th, the track led through grass, mountain bamboo, and cane, until it emerged on to the summit of the Wharton chain, from which an excellent view was obtained. The whole of the forest on the summit had been killed by fire, and gaunt dead trees stood up for miles around. The carriers now suffered much from the rarity of the atmosphere, and camp was pitched at a height of 10,877 feet. Dense fog and rain delayed

\* The Upper Kumusi had been visited in 1901 by Mr. A. L. Walker (Annual Report, 1900-1901, Appendix L, with map).

the party for a day, but on the 8th they proceeded over open grass and heather, with some moss and numerous creeks, and on the 9th reached a camp close to the central peak of Mount Albert Edward, at a height of 12,524 feet. A shallow depression running behind the "Column" visible from Ioma was studded with lakes, the waters of which flow both east and west, their outfalls being visible from Ioma as white patches on the mountain.

During the stay on the mountain the time was spent in taking bearings and photographs, and in a study of its natural productions. Traces were seen both of a graminivorous cloven-footed animal, and of a fair-sized carnivorous animal (probably a wild dog), but no specimen could be obtained, though some pigs were seen by a private of the police force, and regarded with superstitious awe as "devil pigs." Mr. Monckton calls attention to the fact that Sir W. Macgregor, in his report of the Mount Scratchley expedition, mentions that a "long-snouted animal" was seen. The whole of the summit of the range seems to be a hunting ground of the natives, and their tracks and fresh remains of fires were noticed. Much fog and cold rain was experienced, and on the night of May 14-15 the water in the washing basins and pools was frozen. A visit paid to the "Column" involved very rough climbing, which knocked up Mr. Monckton, whose health had suffered a good deal from the fatigues of the journey. It is a 'pinnaele about 60 feet high, with a diameter of about 20, and a rock-terrace extends some 200 yards from it towards the north. On May 20 the highest peak was climbed, two beautiful deep blue lakes being found near the summit, and bearings were taken of Mounts Victoria, Victory, Trafalgar, Lamington, and many others. The height by boiling-point thermometer (temperature 48° Fahr.) was found to be 13,230 feet, or 30 feet higher than that assigned by Sir W. Macgregor to Mount Victoria; Mount Albert Edward may therefore prove to be the highest mountain in British New Guinea.

Among the birds seen on the mountain were ducks, rail, the red bird of paradise, and others that could not be identified. A *Ouscus* was obtained, and many holes of rats and mice were seen. Insect life was abundant. The flowers included white and purple heather, wild strawberries, raspberries, and blackberries, buttercups, and a plant closely resembling the Swiss edelweiss. Many quartz reefs were visible, but no trace of gold could be discovered in them. The descent was made by the spur running south-east from the summit, and the party was back at Ioma on May 28.

During this expedition Mr. Monckton became convinced that there would be little difficulty in continuing the journey across the island to the south-west coast, by a route passing behind Mount Yule, well-defined tracks being seen to run in that direction. He has since, in 1907, carried out such an expedition, though apparently by a route

passing entirely to the north of Mount Albert Edward, by way of the Waria river. This stream, which enters Hercules bay a little north of the eighth parallel, had, until two years ago, been almost unknown, but was traced by Mr. Monckton to its source. The results of the expedition are embodied in our map, but no account of it is available, Mr. Monckton having left this country, while no reference to it appears in the Annual Report for 1906-1907, unless, possibly, in the statement that it had lately been ascertained that the tribes on the upper Waria were resident in British territory. It is also stated (p. 60) that three expeditions have lately been made to the tract occupied by the Red Creek natives—a very small tribe dwelling between the Gira and Waria rivers, and that in the latter part of 1906 a party of miners, with a white officer, had prospected the Waria for gold, but without success. As will be seen from the map, Mr. Monckton's latest journey has added considerably to our knowledge of the country along the Anglo-German boundary north of Mount Yule, as well as of the headwaters of the Lakekamu river.

Other recent work has been concerned with the country on the southwestern side of the island, in the part of the Central Division north-west of Port Moresby. The routes of Dr. W. M. Strong (who, it will be remembered, took part, a few years ago, in the Daniels Ethnological Expedition to New Guinea) have supplied some useful information respecting the inland country north of Redscar bay and Hall sound, where the Roman Catholic missionaries had previously done some good work. The chief results of these journeys, with special reference to the native tribes of this region, are given below. On his journey towards Mount Yule Dr. Strong was accompanied by Father Fillodeau, of the Catholic Mission, who, according to the Annual Report for 1906-07 (p. 12 and map), has since made a more extended journey, accompanied by Father Chabot. The geographical results are embodied in our map. These travellers ascended the valley of the St. Joseph and its northern branch, the Arabure, to S. lat.  $8^{\circ} 10'$ , and their map shows the distribution of the native tribes of the region. Some photographic panoramas of the mountains to the north are also included in the report.

## II. NOTES ON THE CENTRAL PART OF THE SOUTHERN COAST OF PAPUA (BRITISH NEW GUINEA).\*

By W. M. STRONG, M.A., M.D., Magistrate for the Possession.

THE observations embodied in the accompanying map were made during a three years' residence in the area it represents. I first visited this portion of Papua as a member of the Daniels' Ethnographic Expedition, and on the return of the expedition an account of a portion of this area

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\* Map, p. 328.

was given in a joint paper by Dr. Seligmann and myself.\* Since then I have spent over two years in the district as Resident Magistrate, and as far as time and other work allowed I have continued to make geographical observations.

The area mapped extends along the coast from the Purari delta on the west to Galley reach on the east, and is bounded inland by the Owen Stanley range, which forms the backbone of New Guinea. It is only at one or two points that the hills have been penetrated for any distance; while east of Cape Possession practically nothing is known of the inland country, although a number of the rivers have been partially traversed. For the most part the coast-line is flat; but in the Pokau district and at the Cupola the hills of the interior are continued to the coast. At Cape Possession and around Hall sound there is more high ground, but this consists of island-like masses rising from the surrounding plain. Yule island is one of these masses which is actually an island. Between Yule island and the mainland is Hall sound, the only harbour on the coast.

Numerous rivers empty themselves on the coast. The largest of these is the Purari, which flows into the sea by several mouths. The delta of this river is intersected by so many branch creeks that travelling is quite impossible except by canoe. The Lakekamu and Tauri rivers flow into the sea near Motumotu (Toaripi), and very close to each other. Here for some distance the coast-line consists of a series of shifting sandbanks and channels, which are difficult to traverse. Another large river, the St. Joseph, enters the sea at Hall sound, and the adjoining mainland is cut up by numerous creeks, which seem to be old mouths of this river. Other streams enter the sea at Vailala, at Kerema, and at Galley reach. Near the sea at both Kerema and Galley reach the rivers broaden out into extensive areas of water; but the entrances to both these and all the other rivers on the coast are shallow. During the south-east wind, which blows every afternoon for about eight months in the year, the sea is very rough, and it is difficult to land anywhere along the coast except in the neighbourhood of Hall sound.

Geologically, the area considered consists of the main range of the Owen Stanley mountains, formed of deep-seated or perhaps intensely metamorphosed rocks, of some smaller hills of stratified rocks, and of an alluvial plain formed by washings from the hills. On the flanks of the main range, volcanic rocks are often found, and a small isolated area of volcanic rock occurs at "the devil's castle" near the south end of Yule island. At the foot of the main range, large areas are formed by *débris* which has been washed down from the hills during floods. Away from the hills the low country consists of an alluvial plain deposited by the rivers. During the rainy season this plain is mostly flooded, and even in the dry season much of it is nothing but a swamp.

\* See *Geographical Journal*, 1906, p. 235.

Good sections are seen on the coast at Pokama, Yule island, Cape Possession, and on the Cupola. Organic remains are found at the first three of these localities, while on the Cupola I have seen a narrow seam of carbonaceous matter. Geologically speaking, the area has been very recently elevated. At Cape Possession the strata are highly inclined, and at places vertical, yet the shells contained in them are identical with those now found on the seashore. In the interior the valleys are often deep, and the sides very steep, while the high ground between the valleys takes the form of narrow ridges.

East of Cape Possession there is little or no rain from about April to January, but during January, February, and March rain commonly occurs each afternoon. In the hills rain is more frequent, and is not uncommon throughout the year. The dry season corresponds with the south-east monsoon, and the wet with the north-west. West of Cape Possession the seasons are not so regular, and the rain is more equally divided between each month of the year.

At the mouths of the rivers there are large swampy areas covered with yellow mangrove. The red mangrove also occurs, and in places the rivers are lined with nipa palm. Near the coast there is some grassland, but the greater part of the country is covered with very dense bush. Excepting the coastal grassland, there is no open country until the higher parts of the hills in the interior are reached. Around Mount Yule and at the source of the St. Joseph river there are considerable areas of open grass country, with a large native population. In the hilly Pokau district the bush is less dense, and it is here that sandalwood has been found. Wild rubber grows in the forest, but is mostly of an inferior quality. Coconuts grow readily on the flat land, and some trading is done in copra, the dried kernel of the coconut. On the coast the natives cultivate the sweet potato, the banana, yams, and taro; and in the hills the sweet potato, yams, sugar-cane, and tobacco. Maize has been recently introduced, and is grown by some villages. In the swamps the sago tree is plentiful, and sago is an important article of diet and of trade among the natives.

It is quite impossible to give even an approximate estimate of the native population of the district. In the Purari delta there are several large villages containing populations estimated at two or three thousand each. Between Orokelo and Cape Possession the population is very largely confined to the actual coast-line. Here we get a narrow sandbank formed by the sea, while a very little way inland there is only swampy land. The natives build their villages on the sandbank, and live largely on the sago, which grows everywhere in the swamps. East of Cape Possession there are several villages on and near the coast. These villages are for the most part small; but Waima has a population of about eleven hundred. From Inawauni to Inawabui-kipo the St. Joseph flows through a plain which contains numerous villages.

The Aroa river also runs through a similar plain, and on its bank are several villages. All these natives may be classed together as coast people, and are at home only in their canoes or on the plains; they are generally very unwilling to enter the hills. Natives of the Nara, Kuni, Kovio, Fuyuge, and Afoa districts live in hilly or mountainous country, and are generally unwilling to come down to the coast; but they make good carriers for the hills. Between the coast people and the hillmen living in the high mountains of the interior there is usually a belt of country with little or no population.

In the area covered by the map there are numerous groups of people often differing very considerably from each other. In order to illustrate this, the map has been divided according to the tribal groups which inhabit the country. While this division was primarily made for ethnographic and linguistic purposes, still it is very convenient for geographical purposes also. It is very noticeable that there is a distinct tendency for a tribal group to be restricted to an area showing definite physical characteristics, so that geographical and ethnographical divisions often coincide.

The Namau people live in the delta of the Purari river, and all speak the same language. They live largely on sago and coconuts, and at times they eat human flesh. They build large houses, but their canoes are very frail and without outrigger. Still, in these canoes they balance themselves easily, and can move quickly about the creeks of the delta. Their houses, pipes, etc., are plentifully decorated with designs derived from a human face.

The Elema people, so far as they are at all well known, live on the sandy shore of the Gulf of Papua. They also live largely on sago, which grows plentifully in the swampy country immediately behind the shore. They build large canoes with outriggers, and during the north-west season they go long distances in them along the coast. They appear to have borrowed much of their decorative art from the Namau people; but they do not seem to have ever been cannibals. Over this district several distinct dialects are spoken, but they are clearly only different forms of a common language. Very similar people are also found living up some of the creeks and rivers which flow into the Gulf of Papua; but the interior is practically unknown. It is interesting to notice that the only considerable area of high ground near the coast, viz. the promontory of the Cupola, is inhabited by a people apparently distinct and speaking a language with a very different vocabulary.

Yule island and the shore and creeks of the neighbouring mainland are occupied by the Roro people. These, in common with the Kabadi, Mekeo, Pokau, Kuni, Doura, and Motu tribal groups, appear to be immigrants. Linguistically, they are closely allied to the inhabitants of the Solomon and other Melanesian islands to the east of Papua.

Although the language of these groups has much in common, yet they each speak a distinct language. The Roro people cultivate their gardens, and do a certain amount of hunting. Their canoes are not so big as those of the Elema tribe, but during the north-west season they go out to sea in them, and trade with the Elema natives for sago. The Mekeo and Kabadi people subsist largely on the produce of their gardens, but they also hunt the wallaby and the wild pig. They use canoes but little, and then only for crossing the rivers and creeks in their own district. The Mekeo people occupy the flat country on the lower part of the St. Joseph river and the swampy country to the north. The Kabadi people live on a plain near the mouth of the Aroa river. Both these districts are very fertile, but are unhealthy. The Pokau or Nara tribe occupies hilly and comparatively barren country. Their gardens are not very productive, and in consequence much of their time is given up to hunting. They are a more energetic people than their neighbours on the coast. Closely allied to the Pokau people are the Kuni natives. These occupy the precipitous country behind Pokau and Mekeo. The population in the Kuni district is not dense, and only small villages perched on the tops of narrow ridges are found. Doura is represented by only a single village with a dozen or so houses, while there is only one Motu village in the area dealt with in these notes. The Motuans are great traders, and occupy many villages on the coast to the east of Galley reach.

The Fuyuge people occupy the upper waters of the St. Joseph river, where they have many large villages. Other villages exist between the source of the St. Joseph and Galley reach. Korona village belongs to this group, and is situated very close to Galley reach. Like the other mountain races of Papua, the Fuyuge people are darker and shorter than the coast people. Some of the Fuyuge villages are situated at an altitude of over 5000 feet, and here the temperature at night-time is sometimes very low.

The Afoa people are very little known; they live in mountainous country north of the upper part of the St. Joseph river.

The Kovio people live in the mountainous country near Mount Yule. Like the Fuyuge people, many of their villages are at a high elevation, and in one village I saw a hole scraped in the ground and apparently used for living in. The Kovio people are undoubted cannibals, and in part of the district much fighting used to be indulged in. They construct very peculiar houses. Each house consists of a long narrow building divided into separate rooms by cross-partitions. Each room has a separate entrance, and accommodates a family. In the Kovio villages on the upper Lakekamu river much tobacco is grown, and is smoked in a small bamboo pipe of a type quite different to any known elsewhere in British New Guinea.

## A CANOE TRIP TO THE PLAINS OF THE CARIBOU.\*

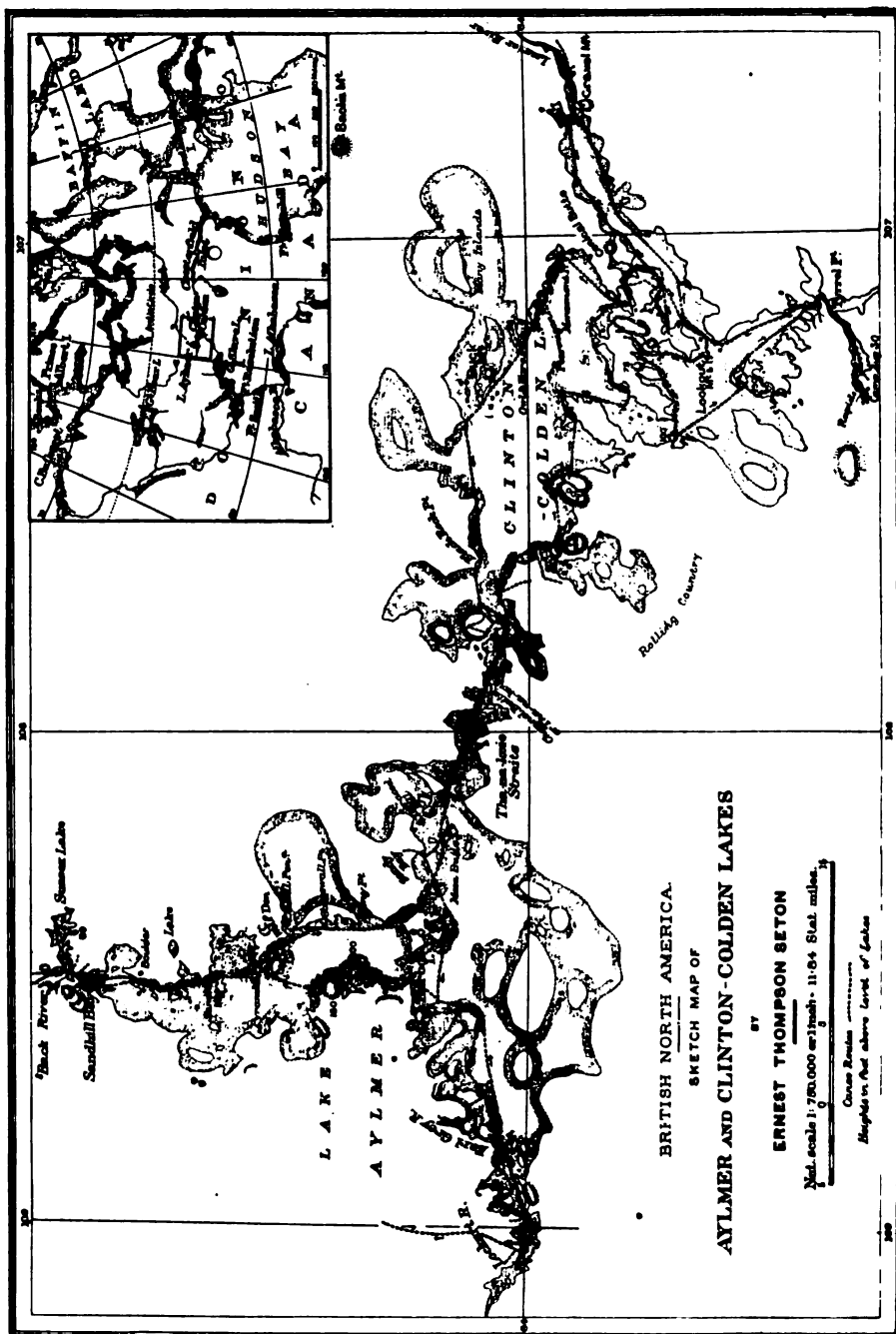
By ERNEST THOMPSON SETON.

IN answer to the query many times put, Mr. Seton explained that it was throughout a private expedition organized, equipped, and directed solely by himself. Its objects were geographical and zoological exploration of the Barren Grounds or Arctic portion of the mainland north-west of Hudson bay. Although the region in question has been crossed by other travellers, as Hearne, Back, and Pike, it has not been explored, and large areas in it are quite unknown.

The expedition left the railway at Edmonton, on the Canadian Pacific Railway, in May, 1907, and at the Athabasca landing set out by canoe for a voyage of 1000 miles to the Arctic Barrens, the land of the caribou, or American reindeer. For 500 miles the route was down the river that crossed the great Canadian wheat-belt, in which are lying idle grain lands enough probably to feed the empire. Partly overlapping the wheat-belt, but extending farther north, is the great Canadian forest which stretches 3500 miles from Atlantic to Pacific, with a width of some 500 miles. The timber in this is mainly spruce, and promises a supply of wood and pulp enough to serve the empire for generations, if not indefinitely. The northern edge of the forest is the beginning of the true Arctic Region, though here not within the Arctic circle. This was crossed on August 1, and from that time until September 15 the explorer's time was devoted to geographical and zoological research. Several weeks were given to compass surveys of the lakes Aylmer and Clinton-Colden. Two great rivers were here discovered: one running into Aylmer from the north was by permission named after the Governor-General of Canada, "Earl Grey river;" the other running into the east end of Clinton-Colden was by permission named in honour of the Premier, "Laurier river." The zoological results also were of some importance. No new animals, but much new light on known species was secured. It is particularly gratifying to know that the expedition demonstrated the existence of a considerable herd of American bison on the Slave river. After, they found musk-ox at Aylmer lake, and it was shown that caribou still exists in millions as in the most primitive times. On September 15 the return journey began, and on November 1 the expedition was safely landed without serious mishap at Athabasca landing. The journey, without hardship, was indeed a delightful summer trip, marred only by the annoying swarms of bloodthirsty mosquitoes that gave no peace day or night, and necessitated the wearing of nets and gloves.

In conclusion, Mr. Thompson Seton pointed out that he had taken the audience on a seven months' trip to the Arctic Region and back,

\* Abstract of paper read at the Royal Geographical Society, March 27, 1908.



showing the country in some seventy-five representative slides, and that, while sunny landscapes, grassy meadows, and stretches of wild flowers abounded, there was not in any picture the slightest hint of frost, ice, or snow.

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## FORMATION OF VALLEYS IN POROUS STRATA.\*

### I. SOLUTION-SUBSIDENCE VALLEYS AND SWALLOW-HOLES WITHIN THE HYTHE BEDS AREA OF WEST MALLING AND MAIDSTONE.

By F. J. BENNETT.

THESE valleys, I consider, owe their origin far more to the action of underground water erosion lasting through a long period, coupled with long subsequent subaërial stream action, than to subaërial agencies only, which were quite a late factor comparatively, and which played a minor part. The Hythe Beds, an important water-bearing bed, consist of alternate layers of hard limestone and chert termed rag, and a soft calcareous stone or soft sandstone and impure sand, termed hassock. Sometimes the hassock occurs without the sag.

The points sought to be established are—

1. That these interrupted valleys were mainly initiated by swallow-holes, and that these were formed by upward hydrostatic action of water under pressure acting from below.

2. That the swallow-holes did occur, and still do, as may be seen in the Willington valley, in the bottoms of valleys, and also on or close to the watersheds; that connected with these are high-level spring ponds, and caverns as in the Willington valley.

3. That the upward hydrostatic action of water under pressure is introduced as a new contributory factor in valley formation, and that this in conjunction with subaërial stream erosion formed the swallow-holes when the valleys in question were under artesian conditions; that a frozen soil cap may act as a top impervious bed in the absence of such a strata.

4. That the channels of these subaërial streams were initiated by subsidence over the courses of the underground ones.

5. That the dry chalk valleys, especially where bourne-holes, either active or extinct, occur, and here classed with these swallow-holes, were formed in the same way as those in the Hythe Beds.

6. That varying water-levels also accompany these valleys, with instances of water passing underground from one valley into another one.

7. That if this mechanical plus solution theory be adopted, comprising early and long-continued subterranean water erosion, coupled with much later subaërial agencies and streams, instead of that of subaërial agencies only, then any denudation rates in such soluble strata must be greatly accelerated.

8. That outliers may help to form valleys.

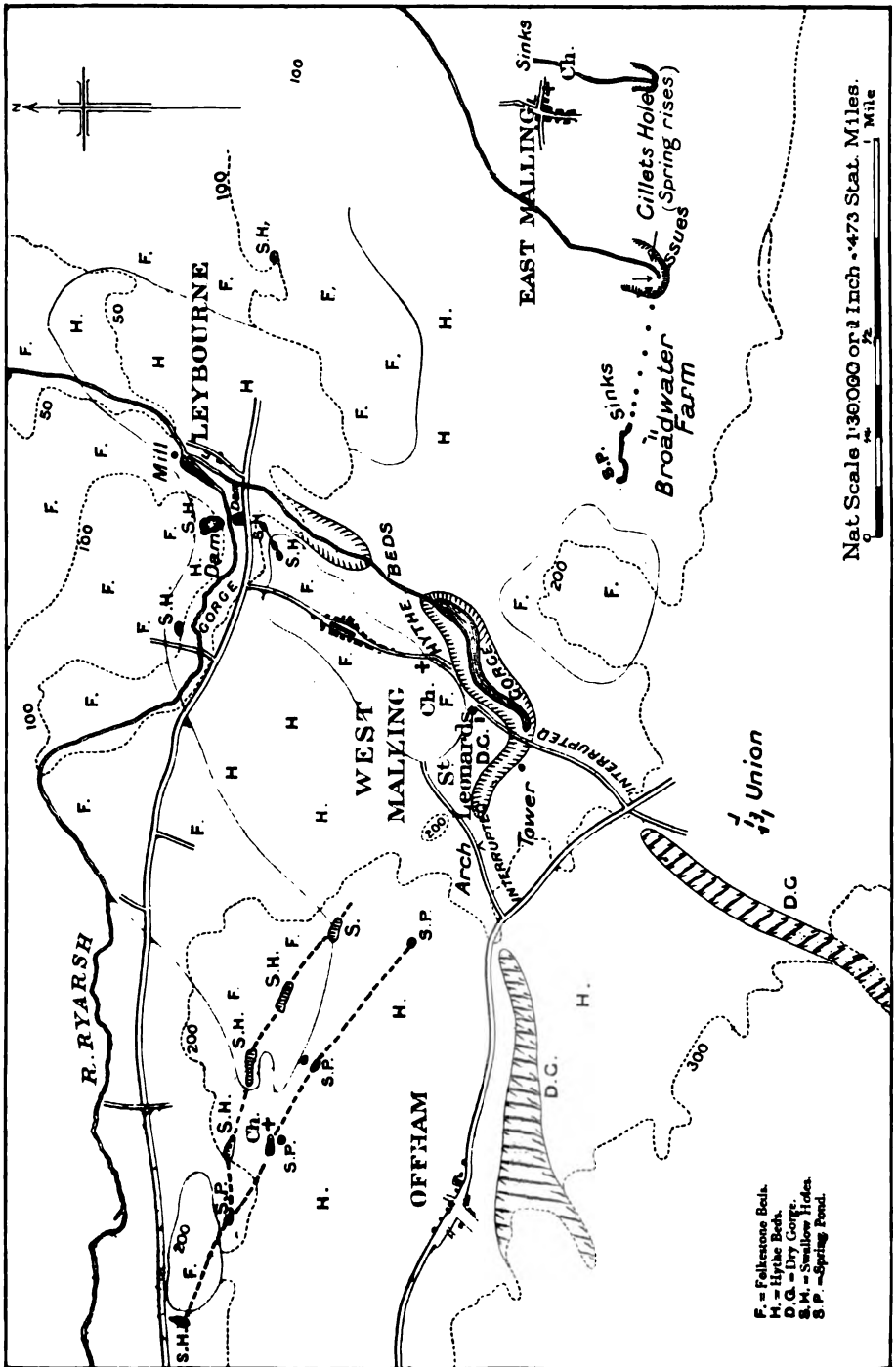
*The Swallow-holes and how they may have been formed.*—These are in the Hythe Beds, and have, as far as I can learn, never been noticed before, owing no doubt to the fact that they are completely concealed by wood, and indeed are thus marked on the map. The largest of these, and the first seen by me, is Langley

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\* Research Department, May 15, 1908.

# Interrupted Valleys, Swallow Holes initiating Valleys and Dam with Bourne Streams. Malling Area.

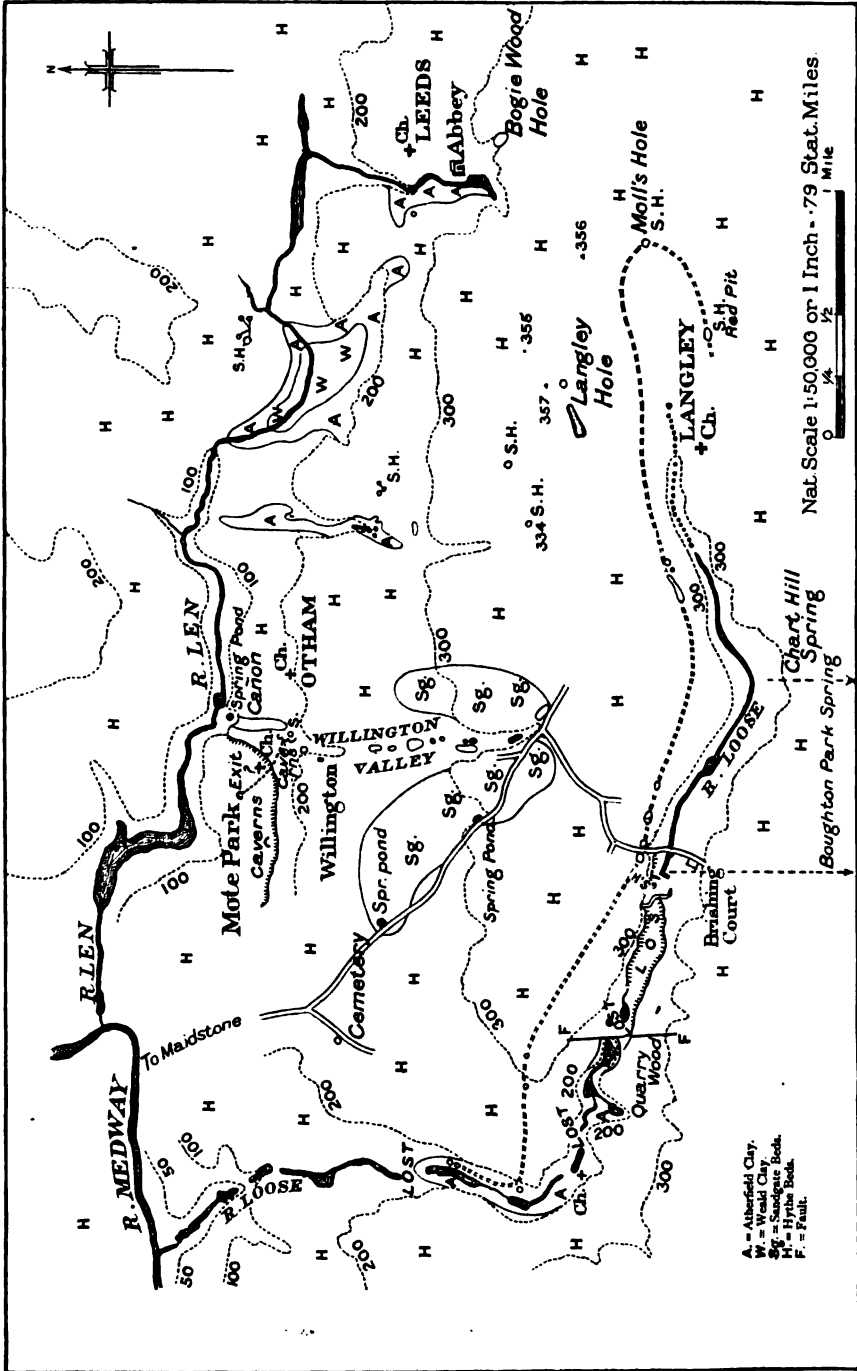
From recent Survey by F. J. Bennett, F.G.S.



MAP I.

A new Swallow Hole Area in Hythe Beds with Valleys initiated by them. In three stages: First, those four by Langley Hole on the water shed; second, those within Loose and Len Valleys thirty-four; third, those along the bottom, as in Willington Valley, with thirteen. The Loose and the Valley too is lost at Boughton Quarries, some water also escaping underground and into Beut Valley.

From recent Survey by F. J. Bennett, F.G.S.



MAP II.

hole, and as the name attracted me, I visited the spot so marked, and seeing only a wood I had to ask where the hole was, and was told "in that wood," and it was not till I parted the foliage that I saw the vertical sides of the hole, measuring perhaps 50 feet.

Many of these I found to have local names, such as Jacob's hole, Bogie Wood hole, Moll's hole, and some are said to be haunted. I have since that called the attention of the Ordnance Survey to them, and they will now be shown as holes, and with their local names, in the new edition of the map soon to appear.

They are of two forms, oblong and crater-shaped. A few occur on the highest ground, as on the water-parting between the Len and Loose, and some, thirteen in number, just within the Loose valley, and others, as those in the Willington valley, along the valley bottom. Langley hole, the largest of the oblong type, is 300 yards long by 70 at its widest part, and perhaps 50 feet deep. The bottoms of the oblong type are most irregular and pitted with deep holes, giving the idea of water action from below. The crater-shaped ones may be 70 to 100 yards in diameter, and may be 60 feet deep or deeper.

Some swallow-holes I consider to have been made when the area in which they occur was under artesian conditions. This would be when the Hythe Beds, underlain as they are by the Atherfield clay, were also capped by the clayey Sandgate Beds. If we reconstructed a valley, as that of the St. Leonard's Park Gorge \* (see Map I.), in such a formation, and replaced the denuded cover, the water in the Hythe Beds would be pent up and under pressure.

This water, acting mechanically and chemically during long periods of time, would have cut out underground channels, causing subsidences of the overlying deposit along this line of erosion. Into this subsidence, much later on, a visible stream would flow, and this would cut deeper and deeper into and through the impervious cover down to any lines of weakness, such as joints, etc., in the Hythe Beds, resulting, as in ordinary well-boring, in the release of the pent-up water, and its escape, doubtless, with much force. It is thus, I think, that the swallow-holes were formed.

Air also would be released with the water, and this would cause a freer and greater flow of the underground stream and the quicker erosion of its channel.

In process of time the series of swallow-holes thus formed would be obliterated by the action of the long subsequent subaërial stream, as this cut down to and coincided with the subterranean one, so that all trace of the preliminary process here indicated would be lost, and all the work appear to have been done by the subaërial stream alone. I consider, also, that the bournes in the chalk valleys were formed in the same way as these swallow-holes, and that they correspond to them.

I have just paid a short visit to the Brighton and Lewes area, and have found some of these old bournes in some of the dry-chalk valleys there, showing that they owe their origin to these once active bournes. The ponds, too, in these valleys, where they show no sign that they have been excavated, may well, I think, be old bournes-holes made water-tight, and thus utilized for ponds.

*The Valleys and Swallow-holes of the Malling Area.*—It was in 1890, on retiring from the Geological Survey, that I came to reside in Malling. I was much struck with the well-marked gorge in St. Leonard's Park (Map I.), where a stream rises, a tributary of the Medway. This gorge seemed to me too large to be the unaided work of this stream; the sides, too, were steep, and there was no valley drift, so that I thought some contributory cause must be sought for, and it occurred to

\* See 'Ightham,' F. J. Bennett, *Homeland Assoc.*, p. 129.



**FIG. 1.—ST. LEONARD'S PARK GORGE.**  
*(Photo. by E. W. Filkins.)*



**FIG. 2.—NATURAL DAM, LEYBOURNE.**  
*(Photo. by E. W. Filkins.)*





FIG. 3.—STEEP RISE AT FOOT OF WHICH THE RIVER ISSUES. AT THIS RISE THE VALLEY IS INTERRUPTED.  
(Photo, by E. W. Filkins.)



FIG. 4.—SWALLOW-HOLE, WILLINGTON VALLEY, [THAT ALWAYS HAS WATER IN IT, AND WHICH RUNS OVER AT TIMES,  
(Photo, by R. C. Grant.)

me that this must be that of the underground action of the water in the Hythe Beds when the area in question was under artesian conditions, and I then formulated the theory already stated.

An outlier of Folkestone Beds once occupied the site of this valley (see Map I.), which then would be under artesian conditions, and one or more swallow-holes may first have been formed, and then afterwards the gorge as now seen, the lake in which has some very deep holes in its bed.

Some twelve years ago striking confirmation of the great upward pressure of the water at the spring-head in the gorge was shown by the forcing up of a sewage tank placed there, and vast quantities of water had afterwards to be pumped away before this could be securely fixed.

At the termination of this gorge, in the park, the valley becomes gently graded for about a quarter of a mile, when another gorge comes on in Bankey meadows, ending with the junction of the St. Leonard's stream with the Ryarsh one at Leybourne Mill (see Map I.). In the Folkestone Beds, on the western side of the gorge, are three depressions (see Map I.). These I regard as swallow-holes, and they are along a north-and-south line.

West of Leybourne Mill the map shows a natural dam (Fig. 2), which once crossed the valley. The stream has cut part of this away. The dam is 10 feet high by 10 broad, and about 100 feet long, and has trees on it. North of and close to the dam is a large swallow-hole, and another to the west of it in the same wood. This dam I consider to be one of the dividing walls of other swallow-holes that initiated that valley. To understand this a visit must be paid to the Willington valley, with its thirteen swallow-holes (see Map II.), and where similar dams can be seen.

Returning to St. Leonard's gorge, this, after the stream-head is passed, continues as a dry one for a quarter of a mile. It then suddenly terminates, and is interrupted for about half a mile (see Map I.), and then continues till it terminates at Offham. Returning again to St. Leonard's, along St. Leonard's Street, a south branch of that valley is interrupted for half a mile, to open again for a mile and a quarter as a dry gorge west of Malling Union (Fig. 3).

*Swallow-holes at Offham.*—The map shows six swallow-holes all along one line, and parallel with the Ryarsh stream. This may be a joint line of weakness, and is close to the boundary between the Hythe and Folkestone Beds. The most westerly of these holes are round, and have water in them; the other four are dry and are oblong. A little south of these is a line of spring-ponds, parallel with the line of swallow-holes. These and the swallow-holes are on the high ground, and may have had their part in forming the valley below.

South-east of Malling, at Broadwater (see Map I.), is a spring-pond. The water from this sinks and runs underground for a third of a mile. With the loss of the stream occurs the loss of the valley. The water reappears at Well Street. With the reappearance of the water occurs that of the valley, with a well-marked cirque-like head. Here two other underground streams apparently come out at the spring-head, and the open stream then runs almost at right angles to that from Broadwater, goes through East Malling, and after that joins the Medway (see map).

*The Maidstone area.*—The area round Maidstone is of great physical and geologic interest; indeed, Sir Roderic Murchison said that no area in the south-east of England was better deserving of a monograph than this one. See *Q.J.G.S.*, vol. 7, 1851, pp. 349 *et seq.* Here I consider that ample confirmation is afforded of the initiation of the valleys there, and at Malling by swallow-holes; but I had formed this view before I had visited the Loose and Willington valleys, where the evidence seems so convincing.

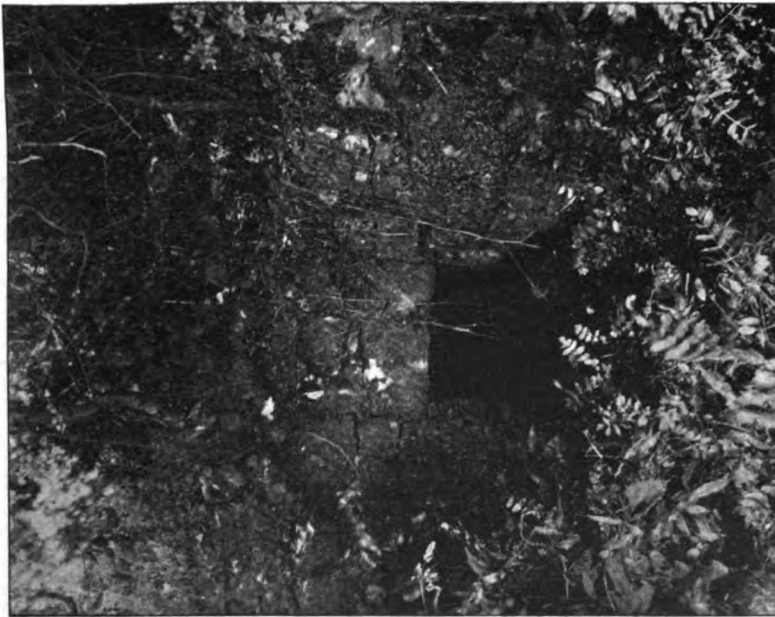


FIG. 5.—WHERE FIRST LOSS OF LOOSE OCCURS: HERE THE WATER MAY BE SEEN  
PASSING AWAY IN TWO DIFFERENT DIRECTIONS.  
(Photo, by E. W. Filkins.)

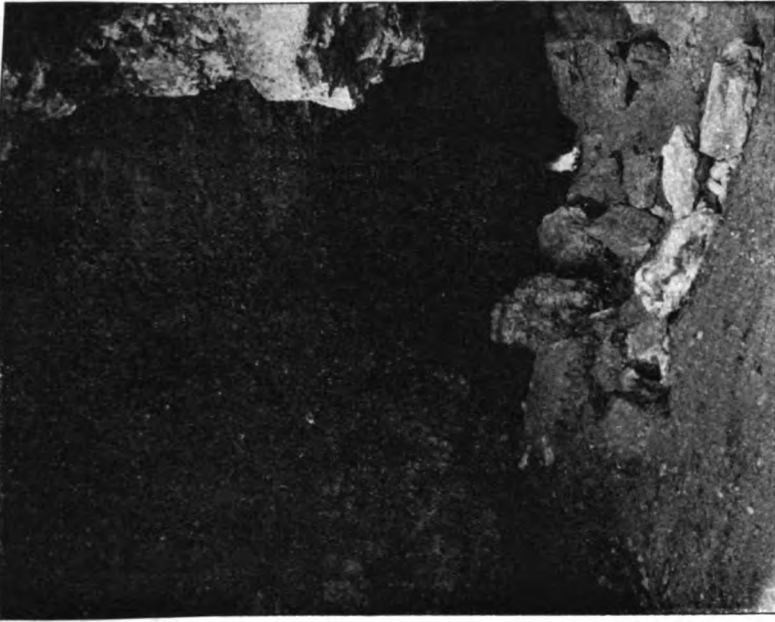
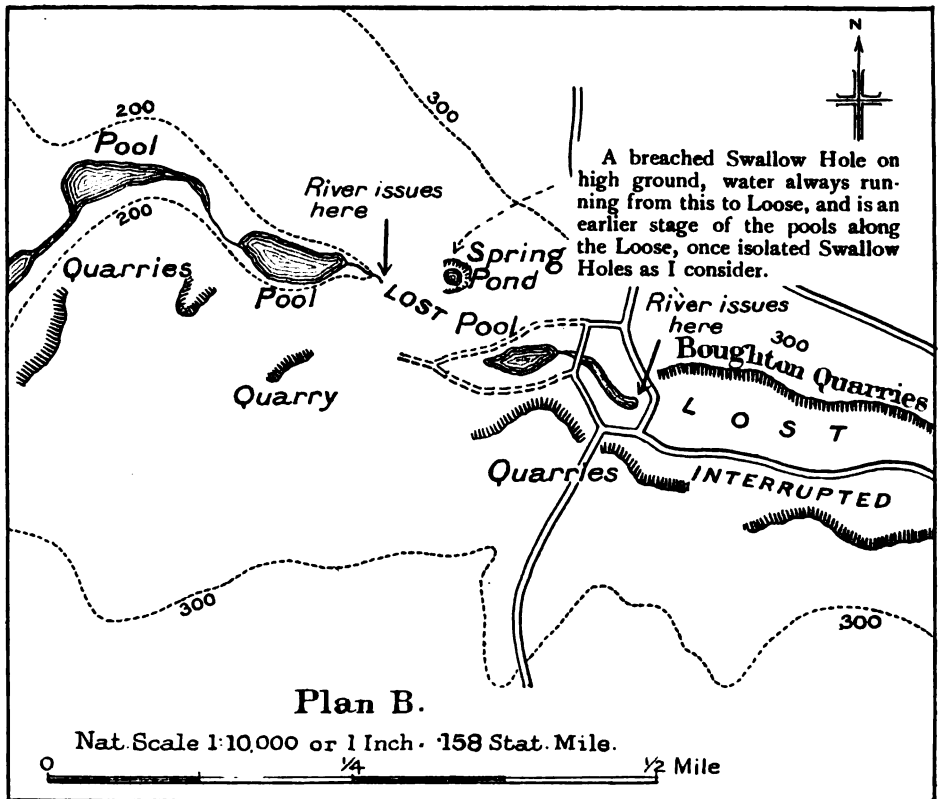


FIG. 6.—ONE OF THE CAVERNS NEAR END OF WILLINGTON VALLEY.  
(Photo, by E. W. Filkins.)

*The Loose Valley.\**—This is a most striking and most beautiful valley, and, were the sides bare rock, would compare with Dovedale, another limestone valley. One striking feature is, that, as perhaps its name may imply, the river is lost, and passes underground at least three times during its course of about 5 miles. At its lower part it is fed by powerful springs, and there paper-mills occur. In the upper part the flow of the water is very feeble, due, I think, as we shall see later on, to some of the water passing away underground into two other valleys.

One fact never noticed before is, that where the stream is lost the valley ceases



to exist and is interrupted and bridged over. Topley, in his 'Memoir of the Weald,' p. 112, considers that the loss of the river is due to a fault, but he only puts one fault, and yet there are three places at least where the river and valley are lost too.

I offer another explanation, and consider that the loss of the river and valley occur where hard rag occurs, and that the open valley coincides with the occurrence of the soft hassock. There are sections where the rag predominates, and others where the hassock almost entirely replaces the rag, therefore there would be hard and soft areas in the Hythe Beds and strong and weak places in any valley in them.

\* See 'Ightham,' p. 131.

The quarries, too, occur naturally where the rag predominates, as the ha·sock has no value at all; and there, also, the valley is non-existent (see Map I. and Plan B). Another feature is the number of pools (see Map I. and Plan B) or small lakes on the Loose. Where these occur the valley is cirque-like, and these pools, I consider, mark the sites of the swallow-holes that once initiated the valley. The sides of the valley are steep, and show very sudden and sharp dips (? slips); these also occur on the Hythe escarpment. There is no drift in it, all pointing, I consider, to subsidence and the predominating action of underground water, and under pressure when the valley was under artesian conditions.

I have stated that the Loose has suffered much loss of water in its upper part. Where the first loss of the river occurs north of Brishing Court (see Map II. and Fig. 5) there is good evidence that after heavy rains the excess water that cannot pass the small natural exit passes away underground to the south, and supplies the spring in Boughton Park, over a mile away and in the Beult valley. But also when the flow was normal, as on a visit recently paid in July, I and others saw some of the water passing away in an opposed direction to the Loose at the natural exit, and with no apparent cause for this; and I have been told that thirty-five years ago, some oil put in at the first loss reappeared at this spring in 2½ hours, and that fifty years ago another such oil-test, I am told, was made. The very powerful stream, too, with a fall of 200 feet in about a mile at Leeds Abbey (see Map II.), may also be robbing the head of the Loose, now dry most of the year for half a mile from its source.

There is good evidence that there are varying water-levels in the Loose valley, for some of the wells close to the stream are over 20 feet deep.

*The Willington Valley.*—This valley affords the strongest possible evidence of a valley initiated by swallow-holes, and indeed still in its swallow-hole stage, and one of arrested progress, due, I consider, to the fact, that owing to some cause the bulk of the water left it, perhaps rather suddenly, so that the separate holes did not get enlarged into a continuous valley.

I visited this one last of all, and it amply confirmed my previous ideas. In this short valley are thirteen swallow-holes, some very large (see Maps II. and III.), but only one is marked on the 6-inch map and this always has water in it (Fig. 6), and after heavy rains overflows and fills the two below it. Close by these is another called Smuggler's hole; \* though larger and deeper, I have always seen it dry, as are the rest further down. It is noteworthy that where the swallow-holes terminate some six caverns occur (see Maps II. and III.); these are clearly due to water action, and they have been traversed for over half a mile. After the last swallow-hole is passed the valley terminates in a cañon; at the end of this is a spring-pond, always full. There may be a connection underground between this pond and the upper swallow-hole that always has water in it, and this water may pass underground into the pond which is close to the Len.

This valley is perhaps unique, and its character has no doubt been preserved owing to its having been thickly planted with trees; to this also may be due the fact that it has not been described before. I have found very few indeed who know of it at all.

*The Len Valley.*—As my space is limited, and as the evidence afforded by swallow-holes in the formation of this valley is not so striking as in the others, I must dismiss it in a few words only. But swallow-holes do occur, and once no doubt were more numerous, but, this valley being in a more advanced stage than

\* I am indebted to Mr. R. P. Grant, of Maidstone, for the following approximate measurement of the hole: 462 feet by 132 feet, and 40 feet at the deepest part.

the others, most of them have disappeared. Some very well-marked gorges occur in this valley, which once, no doubt, were swallow-holes.

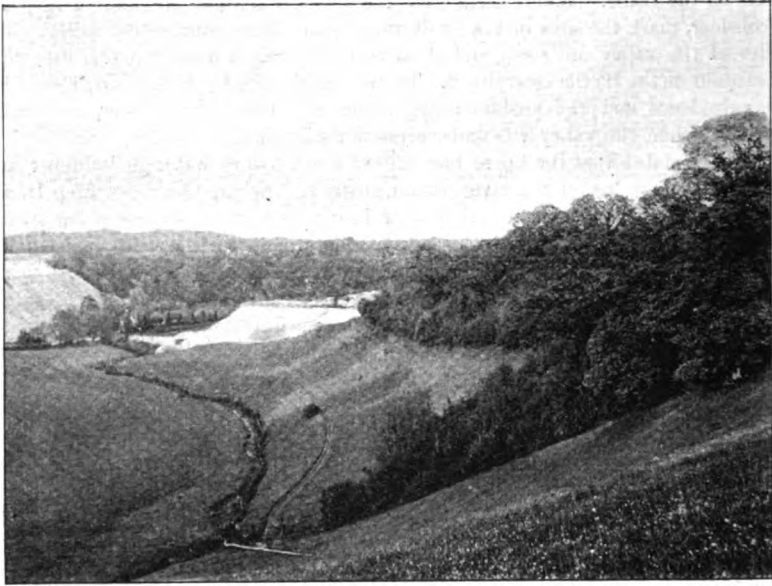


FIG. 7.—GORGE OF THE SHODE, IGHTHAM.

*Concluding Remarks.*—Thus the Willington, the Loose, and the Len valleys show various stages in the formation of a valley from the full swallow-hole stage as in the Willington valley, to the less apparent part at this stage in the Loose, and to the still less apparent in that of the Len; and yet if this key-valley, as I consider the Willington one to be, be first visited, then the stages in the others will, I think, become clear. In conclusion, I trust that I have done something to establish the points I made in the opening part of my paper, and have shown that in the area in question underground water must have played a much more important part in the formation of these valleys than subaërial agencies only.

## II. THE CHILTERN VALLEYS.

By the Rev. E. C. SPICER, F.G.S.

A STRIKING morphological feature of the Chilterns is their strongly marked escarpment face. Seen from a distance the ridge crosses the horizon like a wall. The scarp face, however, is scalloped by a number of peculiar valleys. These valleys eat into the scarp wall and advance backwards nearly to the crest. The head of these valleys very frequently takes the form of a cirque, and from the cirque the valley descends gently to the plain with a floor that is level in cross-section. Other valleys descending suddenly from the crest have a steep but softly moulded outline and descend to the plain with a rounded cross-section. The spurs separating these valleys are bold and striking, with rounded edges. The chalk in every instance

comes quite up to the thin coating of soil, and there is no *débris* until the plain becomes well marked, and here it is due to other causes. The round-floored valleys are always dry, but when followed downwards there is always an issuing stream upon the plain. The flat-floored valleys always contain a stream at some time of the year which issues from the bowl at the foot of the cirque and spreads over the level floor, and is evidently the backward leakage, emerging from the saturated chalk above some hard band of chalky rock.

The streams issuing from the ends of the dry valleys tap the chalk at a much lower level, and are often permanent. But sometimes these deeply sunk valleys have three superposed water outlets. The lowest stream is permanent. The middle stream lasts longer than the upper stream, which runs only when the chalk is saturated and the underground water-level high.

The deeply pitted scarp wall is a very impressive physical feature, and many unsupported suggestions have been made to account for these deep and sudden embayments, ice gouging, glacial scour, fluvio-glacial torrents, and Pleistocene marine action being amongst the most common. None of these is supported by any local testimony. A cause is here suggested which is constantly in operation and is adequate to produce these results. The Thames carries down to the sea 800 tons of lime carbonate daily. This gives for the catchment area of the Thames 140 tons removed yearly from each square mile. A ton of chalk equals 15 cubic feet. Therefore, from each square mile of the chalk area, 2100 cubic feet of chalk are annually removed in solution, 210,000 cubic feet per century from each square mile (see Prestwich, *Q. J. Geol. Soc.*, 1872, vol. 28, p. lxx.). There is nearly as much material removed by the Thames in solution (1 to 4000) as there is by the Mississippi in suspension (1 to 3000), and therefore "the level of the land is as much reduced by what is carried away in solution as if this were mud and sand removed by solution" (Prestwich, *loc. cit.*). The quiet, clear-graded, meandering streams are therefore powerful agents of degradation. This degradation is effected by underground solution, and this solution produces results that are stronger at certain points than at others. The whole surface of chalk is deeply pitted with swallow holes, some of which are 80 feet deep and 30 yards across. Swallow holes are a commonplace of every chalk region. In this case the solution results are evidently local. Some remarkable swallow holes, 30 to 40 feet wide, 20 to 30 feet deep, are cited by Prestwich (*Q. J. Geol. Soc.*, vol. 10, p. 223), at Boughton near Canterbury. A number of streams run down over a capping of London Clay, and plunge into swallow holes in the chalk, and these holes never become full. These streams then make their way underground through any available subterranean channel where a crack or fissure exists, and at Shalmsford Street a large and strong spring bursts out and runs into the Stour. Prestwich suggests that the swallow-hole water descends to the general water-level, but misses the fact that percolating acidulated water will make its way along a series of joints, and tend to produce a "master joint" which will carry an underground stream in hard limestone, but in chalk will tend to produce, by solution, a constantly widening and deepening area of weakness above which the superincumbent strata will sag, and produce at length a deeply sunk valley from the mouth of which, as in the Chiltern valleys, a stream will ultimately issue. If the water made its way downwards and merely joined the general water-level, it would issue in a broad and unbroken sheet of soakage at spring-level, but inasmuch as it does not, but issues in strong local springs and streams, it is clearly collected into underground channels where solution activity is localized and concentrated. Topographical results must follow from the removal of 210,000 cubic feet of chalk per square mile per century. It is suggested that these results are seen in the Chiltern valleys, which are therefore regarded as "Solution Valleys."

A strong contrast is noticeable between the scarp face of the Chilterns and that of the Berkshire downs, just across the Thames. Here the heights are not so great, and the slope to the plain is gentle. There is no wall. In the Chilterns a drop of 500 feet in a mile is not uncommon. In the Berkshire downs a slope of 400 feet in 7 miles is more usual. Below the Chilterns there are no gorges, but only broad open valleys. The Berkshire slopes are deeply trenched. The formation of the rock is in each case similar, but the trend of the joints in relation to the scarp slope is different. In the Chilterns the ridge is parallel to the joints, and has a strike trend, while the dip joints, at right angles to the strike joints, run straight into the scarp wall, and form readily a series of fissures that constantly widen and are kept clear by the ultimately issuing streams. The general height of the plateau will not be readily lowered, but the solution valleys will be very strongly marked and their contour-lines will be closely crowded, while the readily escaping water will form no gorge channels. On the other hand, when, as in the Berkshire downs, the scarp slope runs *across* the joints at an angle, the escaping soakage will tend to choke the joints as it passes over and through them, will make the chalk block more nearly impervious, will thus lower the general plateau-level, while the issuing streams will carve gorges along the more gentle slopes, as they do in the Berkshire downs. So soon, however, as the downs turn, as they do at White Horse hill, and resume the strike trend, the Chiltern features are again immediately manifest. The same cirques, the same crowded contours in the valleys, the same bold spurs, and the same sudden descent from greater heights through short broad open valleys to the plain, while the gorges entirely disappear.

The dip-slope valleys, originating upon the dissected plateau and descending towards the London basin, have characters reminiscent of the dip-slope valleys of the Cotteswold Limestone plateau. Here, too, the valleys at length end in issuing streams. The swallow holes are filled with superincumbent *débris*, and the overlying Tertiary clays subside into the weakened and yielding chalk. In some cases, as at Henley, the valleys run far back towards the escapement crest, which they nearly touch. In other cases, as in the Risborough and Tring gaps, they have eaten right through and joined the scarp valleys, and here the Chilterns have entirely disappeared, allowing the railway lines to pass through the gaps. In one very remarkable case the Thames has taken advantage of such a solution gap, and meanders through the gorge at Goring, before sweeping round to the Henley depression. A precisely similar and parallel gap runs near the Goring gap, from Didcot to Newbury, and carries the waters of the Pang past Hampstead Norris. It will be seen that the Thames, in the curves below Oxford, points towards three valleys in turn: towards Newbury, Reading, and Henley. The stream chose the Reading route through the chalk, and has, consequently, modified that valley, but there is no structural difference between these three valleys, and there is no reason why they should be considered as being due to different causes. The characters of the Goring gap are equally strongly marked elsewhere, and that line of solution weakness is here considered to have got just so far ahead of the others in the "solution valley" formation at some period, as to have determined the issue of the meandering and uncertain river that at length flowed directly through it.

The strongly marked Chiltern valleys run in various directions, but they are in the main "joint valleys." There are no heights sufficient to produce them by superficial denudation, there are no alluvial fans showing the results of underground action, there is no evidence of fluvio-glacial scour, though some ice-action is evident in places, and there is no evidence of strong marine currents. They are too varied in trend and too marked in character to be due to any possible cause that can be logically suggested except one, but they display universally the characters

and results that would naturally arise from the percolation of acidulated water through rock so easily soluble that along broadening joint and fissure lines 2,100,000 cubic feet of rock at least are removed from every square mile in every 1000 years, leaving deep valleys of marked depression sunk throughout every chalk region in every part of England where that rock is found.

After the paper, Dr. STRAHAN: I think that we are under a great debt to Mr. Bennett for calling attention to these swallow-holes, which I believe were altogether unknown until he discovered them, at some risk to himself as I understand. They remind me of swallow-holes which occur on plateaus of Carboniferous Limestone. Though the holes are rather bigger on such plateaus, yet they are dotted about in the same sort of way. It is always difficult in such cases to see where the water goes, whether it issues into some river to the south, or into quite another to the north. In one moorland that I have in my mind reservoirs were made, and it was desired to collect in these reservoirs all the rain that fell on the moorland. Numerous channels were dug to conduct the water past the swallow-holes, and to bring it into the reservoir. But I do not know a single case in which the water which entered the holes was satisfactorily traced. In many other regions, however, it has been traced. In one interesting example a stream disappeared into a swallow-hole which was obviously not large enough to take all the water in time of flood. On my next visit I found that part of the stream was going down the swallow-hole, and part of it following the old course. The one part went into the Irish sea by a fairly direct valley, the other part by an entirely different and far longer route. That was a case where the water which had got into underground channels was diverted entirely from the line of valley. More commonly, the existing ravine, often dry, is followed more or less closely by the underground channel. In fact, it is not uncommon to find holes in the river-bed down which you may creep, and along which you may hear the underground river passing. Herein may lie the explanation of an interruption that Mr. Bennett speaks of in one of the valleys; possibly the river found an underground channel before it had had time to make a valley of any notable depth.

With regard to the second paper, I cannot help thinking that Mr. Spicer wrongs geologists in supposing that they attribute the underground channels to erosion; such channels have always been regarded as having been due to solution. I can hardly conceive how they would start in any other way, and they bear in their shape the evidence of such an origin. A little erosion, no doubt, goes on, but solution is the principal cause. Dry chalk valleys are familiar all over the country where the chalk occurs. Generally, you see nothing except what Mr. Spicer describes, namely, a flat bottom which is occupied by some sort of *débris*, and is bounded by slopes of bare chalk, but there are many places on the coast where more is visible. In Dorset, where dry valleys are dissected by the cliffs, it may be seen that the underlying chalk is rotten, and undergoing solution. The bottom of such a valley is actually being lowered as Mr. Spicer claims. I was interested in one of the photographs, which seemed to me to illustrate a point he made—that the bottom of such a valley with its *débris* is actually now sinking, and that there is a line dividing the subsiding material from the slopes of solid chalk which are not moving. I have myself noticed marks or lines at the feet of such slopes, but the possibility of their having this origin never occurred to me. It is a point which would be worth investigating, and if it proves to be true, I see no reason why the movement should not be measured. Some such apparatus as that devised by a British Association Committee for ascertaining whether there is any movement in

progress along lines of fault, might be used for the purpose. If movement is in progress it would probably be detected in a year or two. There is a great deal of suggestive material in both these papers.

Mr. G. W. YOUNG: I have listened with very great pleasure to the paper by Mr. Spicer, and I regret that I was not here in time to hear Mr. Bennett. My own observations with regard to these dry chalk valleys have been principally confined to the county of Surrey, where the valleys are not quite of the same character as a good many of those Mr. Spicer spoke about, because I understand the principal class that he referred to were what one might call obsequent valleys, while in Surrey we have not many valleys of that sort, and those that there are, do not seem to be anything like so long as those shown in the photographs. But with regard to the valleys which run in the opposite direction, I think that there is a very considerable amount of evidence that they have been made by solution, and practically solution alone. If we take the alternative to solution, i.e. erosion of the chalk by means of torrents due to the melting of the ice at the close of the glacial period, it seems to me that you have not got anything like sufficient gathering ground for the snowfields (or glaciers), which would provide the torrents by their melting, in order to account for the valleys going in both directions. I believe Mr. Clement Reid originally suggested the melting of the snows to account for the presence of thecombe rock in the valleys in the South Downs, where you have a large amount of material apparently deposited in a tumultuous manner, and that theory—that the whole of the valleys have been excavated while the ice had frozen the chalk into so hard a mass that it was able to be acted upon by erosion in some way as if it were a hard rock—seems to have been applied to valleys which he had not in his mind when he originated the theory for thecombe rock. Well, if we consider these deep valleys as being the product of a state of affairs which one may regard as temporary, it seems to me that sufficient time has elapsed since the passing away of those glacial conditions for the removal of such prominent characters of the landscape; because we must suppose that when all the snows were melted, the action of the deepening of these valleys ceased, and that therefore ordinary atmospheric denudation would subsequently tend to lower the general level of the country, and so obliterate such prominent features. Whereas if we imagine that they are due to solution, and there is no reason whatever to doubt that solution may be going on as actively at present as it has ever done, they are probably being deepened rather than being obliterated, and that can be partially proved by studying the material that you find in the bottom of these chalk valleys. If you go down to the Polesden valley, near Box hill, you will find that the material on the floor of that valley is composed of a large number of flints, most of them showing no signs of being rolled about, and moreover, occasionally you may pick up in these flints fossils which are not abraded in any way. The flints are embedded in loose "pelletty" chalk, which is in small rounded fragments, apparently due to slow dissolution. I do not know the Cotswold area, but with regard to the Chalk a very strong case can be made out for their formation by solution, and I may say that Mr. Jukes-Browne, in his memoir on the Cretaceous rocks of Britain, gives solution as being one of the causes which have produced them, and he goes on to point out the protection afforded by the clay coverings which you get, at all events, in Surrey, on the top of the plateau. It is, to my mind, this concentration of the rainfall into certain definite areas which would more rapidly produce dry valleys, than if the clay-with-flints was not present, and therefore I should imagine that in the Chiltern district, if there is no clay-with-flints, or other clay material on the plateau which would act as a protection to certain portions of the ground, the production of these dry valleys would be much slower in that area than in Surrey, where you have the rainfall concentrated into

very definite areas. I have listened with very great pleasure to the lecture, and I thank the authorities for inviting me to be present.

Mr. BENNETT, in reply, said that his view that such valleys as he had described had been initiated by swallow-holes had by some of his friends been severely criticized, but one of these, at least, had been much impressed apparently since Prof. Gosselet, of Lille, had in a recent paper stated that the "creuses" [swallow-holes] of the chalk area of Artois and Picardy could, he thought, be explained only by subsidence from underground water-erosion, and in the same paper he stated that this action of water in limestone areas had not had due importance assigned to it. Mr. Bennett also said that he thought that the evidence for the formation of swallow-holes from below was very clear in the areas he had described. That water could pass underground from one valley to another, as he had shown was almost proved in the case of that from the Loose valley passing underground to that in the Beult, was nothing very new, as such cases had been proved in Yorkshire.

In the 22nd report of the East Kent Natural History Society, Captain McDakin, Dover, on "Nailbournes at Bridge and Petham," etc., gives his opinion that "blow-holes" may be formed by a cylindrical column of water acting on the limestone above it like a fountain jet.

Mr. SPICER: I have only to repeat my thanks to the Society for the privilege of reading my paper. I welcome Dr. Strahan's suggestion for measuring subsidence, but there is a certain difficulty owing to the fact that the chalk in these subsiding valleys is often rotten. The solution valleys investigated by Mr. Young are, I think, of the same character as those leading from the Chilterns to the London Basin, where the overlying clay has subsided into the chalk hollows.

Major CLOAR: I think we are very fortunate to have been able to listen to such excellent papers as those we have just heard. We are apt to lose sight of the fact that it is practically impossible to be a good geographer unless one knows something of geology, and we are very much indebted to Mr. Bennett and Mr. Spicer for having given us this opportunity of listening to such excellent accounts of a very interesting subject, and I am sure you would wish me to thank them for their papers.

## REVIEWS.

### EUROPE.

#### ISTRIA.

'Die Halbinsel Istrien.' Landeskundliche Studie von Dr. Norbert Krebs, K.K. Realschulprofessor in Wien. (Penck's *Geographische Abhandlungen*, Band IX. Heft 2.) Leipzig: Druck & Verlag von B. G. Teubner. 1907. Pp. 166. Price 6m.

WE have here a detailed account of the peninsula, its geology, hydrography, climate, and vegetation, its inhabitants and their industries. The peninsula has the form of a triangle about 60 miles long, with a maximum breadth of 46 miles, and rises from the south-west coast gradually up to the Dinaric Alps. Owing to its undulating surface and the absence of coastal plains, it may be regarded as a part of this range jutting out into the sea. On the whole, Istria may be called a karst land, for three-fourths of its surface consist of karst-forming limestone, and only one-fourth of sandstone and marl. It falls into four zones—a zone of flysch in the valleys of the Wippach and Reka, another between Triest and Salvore gradually contracting south-eastwards to the Čepić lake, and between these two

broad zones of limestone. These latter zones have much in common, the karst phenomenon being present in both, but the high karst land of the interior is of a mountainous character, particularly the Tschitschenboden, with an average elevation of over 2600 feet, whereas the Istrian plateau is for the most part a surface of abrasion sloping down to the Adriatic from a height of 1500 feet, with a steeper fall towards the Arsa channel and the Quarnero. Here, on a deep layer of soil produced by weathering, fruit, vines, and corn flourish. The sandstone zones form hills or uplands of gentle outline. The difference between the two zones is due to elevation, the more northern zone being higher, and to the difference of climate. With few exceptions, the streams of the peninsula are confined to the sandstone districts. As regards climate, the peninsula is a transition region between the mild Mediterranean climate and the central European climate. The summer is very dry, and heavy rain falls in autumn. Climatological factors have made a great impression on the physical geography of the country and on the vegetation. The higher parts at a distance from the sea have the dense vegetation of the Central European climate, with dark woods of tall trees and green meadows, while in the lower parts nearer the sea the vegetation becomes more scattered, meadows are absent, bushes take the place of woods, and the plants become hard and thorny, and their leaves are covered with hairs, which retard evaporation. Dr. Krebs also sketches the history of settlement in Istria, and describes the present population of Germans, Slavs, Serbo-Croatians, and Italians, and their occupations. Almost all the land ( $97\frac{1}{2}$  per cent.) is productive, according to statistical reports, and 67 per cent. of the population live by agriculture and the exploitation of the forests. Other branches of industry are also touched on, and the distribution and increase of the population is described. Numerous sketch-maps and sections illustrate the work.

#### RUSSIA.

'*Länderkunde von Europa, herausgegeben unter fachmännischer Mitwirkung von Alfred Kirchhoff. Dritter Teil: Russland. Von Prof. Dr. Andreas v. Krassnow in Verbindung mit Prof. Dr. Alexander Woeikow.*' Leipzig: G. Freytag. 1907. Pp. 336. Price 3 m. 50 pf.

The difficulty of finding an author thoroughly acquainted with Russia in Europe, and other obstacles, have long delayed the appearance of this volume. The work has been at length brought to a successful conclusion by Prof. Krassnow of Kharkof. Nearly half of the book is taken up with a description of the geology, coasts, configuration, and hydrography of the country, which is in general carefully drawn up. The author's account of the Ural-Baltic ridge seems to be new. On p. 2 he says, "North of the Central Russian plateau a number of elevations may be noticed. They come out of Finland as the Maanselke-Olonets ridge. Extending further east, north of the Onega, they merge imperceptibly into the Severnyie Uvaly, where more exact measurements are desirable," and on p. 104 he says of the Uvaly that, "although regarded as an offshoot of the Ural system, this hypothesis is not yet proved. They run east-south-east along the southern boundary of the province Vologda and disappear at the Kolo lake." Several geographers have denied the existence of a continuous ridge between the Urals and Baltic, while many trace it from Kurland, but the connection of the Uvaly with the Urals has been taken for granted. The chapter on climate is by Dr. Woeikof, the greatest authority on the subject. The influence of snow has been the object of exceptionally thorough observation, and Dr. Woeikof makes the striking statement that without the snow-covering the cultivation of winter corn would be impossible over two-thirds of the area of European Russia. Other

chapters deal with the fauna and flora, the races and the numerous mixed peoples, means of communication, administration, economical development, etc. A few words might have been given to education, and the Duma should have been mentioned. The general condition of the people is, however, fully described in connection with agriculture and industries, and the causes (land tenure, etc.) which arrest the progress of the Russian people are noted. The last chapter, on the towns, is of the nature of a gazetteer. If a smaller number of principal centres of industry and commerce had been selected, and their origin traced to the natural or political advantages of their situation, this chapter would have been better suited to a geographical work. The illustrations include many small maps, but some one would expect to find are absent. Such are a hypsometrical and hydrographical map on a larger scale than can be inserted in the text, a geological map, and a map showing the minerals and chief manufacturing centres; also a railway map. On the whole the work is a valuable contribution to geographical literature, especially the chapters on physical geography, which are compiled from the latest information. Exact surveys have not been executed over a great part of Russia, and many geographical problems still await solution.

### ASIA.

#### ACROSS ASIA.

'From Peking to Sikkim: through the Ordos, the Gobi Desert, and Tibet.' By Count de Lelaid. *With Map and Illustrations.* London: John Murray. 1908.

There being nothing to show that this book is a translation from a French original, we shall assume that the author has written it in English as it stands; if that be so, the performance is at once highly creditable to his knowledge of our language, and explains some slight peculiarities of expression to be found here and there throughout the volume. Moreover, he was unexpectedly summoned to South America before the sheets had finally passed through the press, and Mr. Murray, at his request, has written the preface. From it we learn that the journey was in fact a wedding trip, "undertaken to gratify our wish to cross country hitherto unknown, and if possible to increase the geographical knowledge of our day." The ambition is laudable, and is in a measure fulfilled; for though other travellers have crossed and recrossed the route selected by the Comte and Comtesse, none can be said to have followed the precise line save here and there on known roads. The names of Major Bruce, Sven Hedin, Rockhill, Littledale, and Bower in recent times, and of Huc and Gabet in 1845, occur to any student moderately familiar with the geography of Chinese Turkistan and Tibet, and many other names might be added.

Our travellers started from Peking on June 20, 1904, reached Sien-hua-fu on June 26 *en route* for Mongolia. At Or-tan-ho, where they expected to find Mongols, they found Boxers, the place being a retreat for brigands and a nursery for rebels. Passing on to Ta-tung-fu, they visited the grottoes of Yung-yang-miao containing relics of Buddhist architecture. "Though now in poor preservation, they remain a proof of some sculptural achievement. Each room contains over a thousand figures, some nearly 6 feet high, others only a few inches. The ceilings especially are a maze of painted dragons. The statues also were painted, but are now discoloured by the effects of the water." Further on a diversion was made to Edchen Koro to see the tomb of Chinghiz or Jenghis Khan, "so jealously guarded," says the preface, "by its custodians that no European has hitherto been able to discover its actual site, much less to see it." Yet in Yule's 'Marco Polo,' 3rd edit., vol. 1, p. 249, mention is made of visits by MM. de Vos and Verlinden, two

Belgian missionaries; and M. Cordier (relying apparently on Rockhill, 'Diary,' p. 29) says, "The last traveller who visited the tomb of Chinghiz is M. C. E. Bonin, in July, 1896." The description given in this note agrees reasonably with that by our author: "Two small tents, one behind the other, and connected by a very low inner door, made of worn-out felt, and admitting through their rents the rain and the wind, are the 'monument' destined to perpetuate the renown of the greatest conqueror the world has known. . . . The ashes of the body of Jenghis Khan are deposited in a kind of chest, cubic in shape, and placed on a wooden support made of small coloured pillars, adorned with paintings on all its sides, except that facing south, which is covered with a finely worked copper plate representing a divinity surrounded by four animals which are difficult to identify. . . . The Tomb, in fact, has not always been here; but it is difficult to know exactly where the first descendants of the great Emperor laid his remains."

Thence the travellers crossed the country of the Ordos to Ning-hsia, on the Yellow river, a town described as killed by opium, and passing round the Alashan mountains *viâ* Lan-chou reached An-si-chou, whence they proceeded in a fairly direct line, considering the country, across Tibet to Shigatse on the Brahmaputra, where they were entertained by Captain O'Connor. They then passed into Sikkim and enjoyed the hospitality of Mr. Claude White, the political agent, "with the pleasant feeling of having succeeded at all points in our long and dangerous journey."

The volume is well turned out, and there are not many printer's errors. At p. 54 "heaps of verdure" probably have been substituted for something less fragrant; and at p. 139 a well-known name appears as Baron von Reichtoffen! The illustrations are fair, and the route map, though sketchy, is sufficient. The author's transliteration of names has generally been followed in this notice.

W. BROADFOOT.

## AFRICA.

### WEST AFRICAN BORDERLANDS.

'Les Frontières de la côte d'Ivoire de la côte d'Or et du Soudan.' Par M. Delafosse. Paris: Masson et Cie. 1908. *Price* 6 fr.

M. Maurice Delafosse is known as a sympathetic and patient investigator of the manners and customs of the negroes of the Upper Guinea coast. He is also an expert surveyor, and the book before us records the work of the Anglo-French commission, which, in 1901-1903, determined the boundaries indicated in the title of the volume. M. Delafosse disclaims for himself and his colleagues the title of explorers, but the accurate mapping of 3750 miles of frontier was no mean achievement. The book is, however, of greater value for its ethnographical than for its geographical information. The author has studied several of the languages spoken by the Ivory Coast natives, and is thus the better able to enter into the ideas of these primitive folk. He has interesting philological notes, showing that amid much linguistic confusion similarity of structure exists among diverse Negro languages. No one tongue is common over a really wide area, though Fanti is more or less the official native language on the Ivory Coast. A considerable part of the value of the book lies in its panoramic effect. From the forest regions of the coast we pass to the open plains of the plateau, and to the upper basin of the Black Volta, and note successively the difference in the character and culture of the inhabitants—the N'Denie, Abrow, Birifo (about whom there is much new information), Dagari, etc. In the northern region the boundary commission found still in ruins several small towns and villages ravaged by Samory many years since

(M. Delafosse, by the way, entertains a high opinion of that redoubtable opponent of the French); in the south the good effect of European administration was evident in prosperous villages and well-cultivated lands. A chapter is devoted to the history of "the Jenné of the South," Bondoko (Bonduku), the fullest we remember to have seen, and a distinct addition to the scanty records of the Guinea negroes. It is stated that the (now hidden) Ashanti gold stool was captured by the Ashantis at Bondoko about 1820, and taken in triumph to Kumasi. M. Delafosse's volume is well illustrated, and has a small sketch-map; but, like too many French books, it lacks an index. It is a substantial work, containing matter of permanent value.

F. R. C.

## AMERICA.

### THE VEGETATION OF CHILE.

'Die Vegetation der Erde. . . ' Herausg. von A. Engler und O. Drude. VIII. Grundzüge der Pflanzenverbreitung in Chile, von Dr. Karl Reiche. Leipzig: W. Engelmann. 1907. Pp. xiv. and 374. *Maps and Illustrations. Price 20 marks.*

For this, the eighth volume of Engler and Drude's valuable monographs on the vegetation of the world, we have to thank Dr. Karl Reiche, who is, of course, the foremost authority on Chilian plants.

The general scheme follows closely that of other volumes of the same series. There are sections dealing with the orography, hydrography, and climatology, vegetation forms and vegetation formations, biology, an historical introduction, including a long and valuable list of books and papers dealing with Chilian plants or with natural history, and also detailed descriptive lists of the vegetation of twenty-seven selected portions of the mainland and three groups of islands.

The disappointingly short and condensed account (some twenty-five pages) of the development and origins of the Chilian flora is, however, of real interest to all geographers, and it is especially valuable as giving, so far as one can judge, the latest opinions of Dr. Reiche himself upon such vexed questions as the age of the Andes and a former connection of South America with the Antarctic continent. So far as the distribution of South American plants is concerned, he is probably the best living authority, and one would be inclined to take his views on the subject as conclusive, were he not so extremely cautious and so guarded in the expression of them. Indeed, Prof. Dr. Reiche has taken so much care to give all the evidence that could be advanced against his own conclusions, that it is sometimes very difficult to discover whether he believes in them or not.

An interesting and characteristic example occurs in his treatment of a new discovery made by himself. He found that on the dry and arid cordillera, which is patiently grazed by hungry mules and guanacoës, several plants are exceedingly difficult to see. Their leaves are exactly the colour of the reddish-brown soil on which they grow. No sooner has one realized the interesting character of this new discovery in protective coloration, than Dr. Reiche promptly destroys all the importance of his own observation by the remark that the theory (of protective colouring) "is scarcely tenable, for most of the named examples would give but a right small bite."

He distinguishes seven contingents in the Chilian flora. Two of these (Cosmopolites and Introductions) are not of any general interest. As regards another, the North Temperate (and often European) contingent, it is very interesting to find *Armeria*, *Alopecurus alpinus* and *Phleum alpinum*, *Saxifraga cæspitosa*, and many others flourishing in Chile, but there is no satisfying explanation for their presence there. The albatross may, as has been suggested by Pax, have introduced *Gentiana prostrata* to the cordillera.

But the existence of a well-marked Antarctic contingent has long been understood, and Dr. Reiche gives a full account of it. There are one hundred and four genera and sixty-five species common to Chile and to New Zealand. Moreover, seventeen of the genera are markedly Antarctic.

Even if one excludes such genera as *Salsola*, *Urtica*, *Poa*, and all ferns with species like *Montia fontana* and *Potentilla anserina*, there are more than enough remaining to imply a former land connection (or island chain) with an Antarctic continent which also reached out in promontories or islands towards New Zealand.

It is surely impossible to explain such close and far-reaching affinities as these by Humboldt's current or the agency of birds. The presence of Antarctic beech itself would not be easy to explain, for though its seeds are "winged," their power of flight is surely a very rudimentary one. Moreover, the Antarctic contingent as a whole behaves exactly as one would expect. It is rich in numbers near Fuego, where the climate is essentially an Antarctic one, and gradually tails out as one proceeds northward to the dry and hot districts of middle Chile. *Primula farinosa* extends to 39° S. lat., and a whole colony of southern forms exists in the classical wood of Fray Jorge in 30° 40' S. lat.

But the tropical American contingent is more interesting still. The coast mountains of Chile, composed of crystalline schists, granite, and eruptive rock, are by far the oldest part of the country. They existed when there was no Andes, and when South America consisted simply of Archiplata, Archiguyana, and Archibrazil—that is, of three isolated land masses separated from one another by great sea-inlets. During the Mesozoic period these land masses were inhabited by a common flora; at first—that is, in the Rhaetian period represented by the lacustrine deposits of Copiapo—by such plants (Ginkgo-like conifers, ferns, and cycads) as occur in the fossil deposits of this age in Europe and elsewhere, but later on by a tropical flora consisting of many ferns, tree-ferns, large-leaved laurels and Bombaceae, which distinctly implies a warm and humid climate very different from that which prevails in Chile to-day.

Dr. Reiche seems to accept the theory that this ancient Brazilian flora was in relation with that of India through Africa. It is the descendants of this ancient tropical American flora which still inhabit the coast mountains of middle Chile. These include the Chilean palm, *Araucaria*, such genera as *Ionidium*, *Peperomia*, *Abutilon*, as well as many Bromeliads and Bignoniaceae.

Patagonia was even in Tertiary times apparently colder than the neighbourhood of Coronel-Lota, for the coal-mines near Punta Arenas have yielded a flora which is not tropical (Antarctic beech, *Araucaria*, *Flabellaria*, etc.). But even to-day the middle and South Chilean forests have a distinctly tropical appearance; they are full of creepers, epiphytes, etc., such as are most unusual in temperate woods. Dr. Reiche explains the affinities of the coastal flora of Chile with Brazil and these tropical resemblances by suggesting that they are an outlying fragment of the original Brazilian flora cut off by the slow and gradual upheaval of the Andes, and subsequently altered by a change of climate.

It is not only in the plants that one finds a resemblance with Brazil or tropical South America, but also in the fauna, for vampire bats, sunbirds, scorpions, termites, and especially two freshwater crustacea (*Parastacus* and *Æglea*), occur on both sides of the Andes.

The process of formation or upheaval of these mountains has been, according to Reiche, very slow, gradual, and long continued. They did not exist at all in the Jurassic period; even in Cretaceous times there was much subsidence and encroachment by the sea. But when the cordillera of the Andes did eventually make its appearance, the then existing flora of Chile was cut off from that of tropical Brazil, and much altered by the increasing aridity of the climate.

There are several curious points mentioned in this work which tend to prove that the Andes are very modern, comparatively speaking. Thus the mastodon inhabited the province of Aconcagua and down to Linares in comparatively modern times, as is proved by its bones occurring along with recent molluscs, and even *Drimys*. Such an animal could scarcely have lived at 4000 metres altitude, as at Ulloma, in Bolivia, where its bones have been discovered.

If one admits that the process of upheaval of the Andes is responsible for the increasing drought of the northern districts of Chile, then it may still be proceeding even now. Dr. Reiche mentions several curious facts which bear upon this last point, as, e.g., a map dated 1765, which represents running water in the pampa of Tamarugal, the existence of malarial fever, remains of the shrub *prosopis* in the upper layers of the soil, and regulations for the supply of water, which are decidedly unexpected in that arid district. Yet there is subsoil water, though at great depths, and on the whole the argument from these data is not very convincing. Perhaps one should also mention here the interesting observations of glacial action in very unexpected places, as, e.g., at Copiapo, 27° S. lat., at 1300 metres altitude, the Los Andes moraines at 2500 metres, glacial striae at Curico, 2800 metres, as well as at Linares and Chillan.

But that a dry climate and very high mountains have existed for a very considerable period is very clear from the existence of two other and important constituents of the Chilian flora. These are the Californian contingent, which seems to have travelled southwards in Post-Pliocene times, and the Andine contingent. This last is a very peculiar and remarkable series of dry climate, high Alpine plants, which are for the most part endemic, and are apparently modified descendants of the tropical American flora. They are succinctly described in the biological part of the work, which is of great botanical interest. Perhaps the most curious are the cushionlike tufts composed of short closely crowded branches. There are forty-three of these strange types. Dr. Reiche found that in one of them, *Azorella madreporica*, the twigs were so closely pressed together that a revolver bullet would scarcely penetrate into the plant. This close cushionlike growth is of great importance to the life of the plant. At 1 p.m. in March, the temperature in one of them, *Azorella*, was 21°, whilst that of the sand beside it was 38°. At 6 a.m. next day, when the sand temperature was 3°, that in the plant was 5°. If one compares a climate of this kind with that of a jungle forest, where the ancestors of those Andine forms used to live, it is not surprising that they show remarkable differences.

In the special section dealing with climatology there is, of course, much valuable information, but the difficulty of giving concisely any account of the Chilian climate may be understood if one remembers its extraordinary variations in different latitudes. In the far north there is rain once in five years; in other parts 8 mm. per annum. As one proceeds south almost every transition occurs in the amount of rain until one reaches the Evangelistas lighthouse near the Pacific mouth of the Straits of Magellan, where there is a magnificent rainfall of 3449 mm. every year.

These extracts will be sufficient to give some idea of the importance of Dr. Reiche's work. It is unfortunate that there is only a very short index.

G. F. S. E.

## MATHEMATICAL AND PHYSICAL GEOGRAPHY.

### MARINE METEOROLOGY.

'Meteorological Atlas of the Indian Seas and the North Indian Ocean.' Prepared chiefly by W. L. Dallas, under the direction of Gilbert T. Walker, M.A., sc.D., F.R.S., Director-General of Observatories. Simla: Published by the Meteorological Department of the Government of India. 1908.

The Indian Meteorological Department have in this atlas generalized the great mass of observations accumulated for the eleven years 1893-1903 from vessels navigating the Indian ocean and entering the ports of Bombay or Calcutta. The barometers of the ships contributing the information are subject to regular inspection by officials of the department. The wind direction, force, and frequency deduced from the same records, are indicated on the maps, and the mean currents are added not for the same period, but from the monthly weather-charts of what the compiler terms the "English" Hydrographic Office.

The atlas contains four series of charts. The first of these is a set of twelve, showing the Indian ocean to 10° S., with the normal pressure for each month represented by isobars, the wind direction and force for each 4° square, and the average current. The introductory letterpress gives general directions for the use of the charts by ship-masters, and there is a page of description prefixed to each chart, giving a brief but thoroughly practical summary of the normal weather conditions, with notes on the probability of storms. The annual range of pressure and the annual changes of wind direction are beautifully shown as one passes the several maps in review.

The second series of maps includes nine, showing the storm-tracks for each of the months April to December, none of importance being on record for January to March. The tracks of all the principal storms since 1877 have been shown for the Arabian sea, but those recorded in the Bay of Bengal are so numerous that a selection has had to be made. It is remarkable that very few storm-tracks cross India from one sea to the other, the storms of the Bay of Bengal and the Arabian sea having, as a rule, a local origin.

The third and fourth series of charts include ten plates for the Arabian sea and five for the Bay of Bengal, showing the isobars of typical storms, three storms being dealt with for each sea, the isobars of consecutive days being shown. These are extremely instructive, illustrating the comparatively small areas, steep gradients, and very deliberate movement of the storm centre which are characteristic of tropical cyclones. Each storm is described in detail, and the atlas, as a whole, forms a work of reference as valuable to the student of physical geography as it is indispensable to the navigator of the Eastern seas.

H. R. M.

### THE STANDARD TEXT-BOOK ON OCEANOGRAPHY.

'Handbuch der Ozeanographie von Dr. Otto Krümmel, ordentlichem Professor der Geographie an der Universität in Kiel.' Band I. Die räumlichen, chemischen und physikalischen Verhältnisse des Meeres. Stuttgart: Verlag von J. Engelhorn. 1907.

In 1884, Prof. G. von Boguslawski published the first volume of a treatise on oceanography in Ratzel's Library of Geographical Handbooks, and the second volume was subsequently prepared by Prof. Krümmel. The work has been out of date for some time, on account of the rapid advance of the science of oceanography, and Prof. Krümmel is probably the only man who has continuously kept pace with the ever-increasing volume of literature on the subject. His periodical digests

in Wagner's *Geographisches Jahrbuch* have been of the utmost service to other students of the subject, and his collection of oceanographical apparatus at Kiel is an epitome of the development of methods and appliances which has been so conspicuous in recent years. There is, therefore, no one so pre-eminently fitted as Prof. Krümmel to bring into systematic form the broad lines of our present knowledge of the science of the oceans, and we welcome his great work with the heartiest appreciation.

Prof. Krümmel spends little space on historical introductions, and indeed that part of the work was done so well in the *Challenger* Reports that it may appropriately give place here to a review of the vast expansion of knowledge resulting from the pioneer expedition, which laid the foundations so broadly and well.

In fixing the place of oceanography amongst the sciences, Prof. Krümmel ranks it as one of the main branches of geography, which he enumerates as chersology, or continental study, oceanography, meteorology, and biogeography. Like the other departments, and like geography itself, oceanography is divided into general and special, the former dealing with the ocean as a whole with regard to space-relationships, the substance of which it is composed, and the energy of which it is the medium; the latter dealing specifically with the peculiarities of the several oceans and seas.

The four long chapters which compose the volume deal comprehensively with the ocean basins, oceanic deposits, sea-water, and sea-ice. The systematic subdivision is carried, in the German fashion, to a high degree of minuteness, to which the most serious fault we can suggest is that the terms are frequently untranslatable into English, and the classifications themselves in some cases are not improved when divested of their German dress. We are far from suggesting that Prof. Krümmel is blind to the work of others than his own countrymen; he is, on the contrary, extremely impartial, and does the fullest justice to the work of all scientific men, fully recognizing the paramount place of British men of science in laying the foundations of modern oceanography, while by no means willing to accept as limitations or dicta of finality the achievements or views of the founders of the science. Oceanography is in a special degree capable of being advanced by international co-operation. Maury started the tradition by his enthusiastic efforts in the fifties of last century, from which meteorology as well as oceanography may be said to have received national embodiment and international support. Sir Wyville Thomson and Sir John Murray developed it by the broad views which united the scientific workers of all nations in working up the *Challenger* collections, and the international co-operation of the nine North Sea and Baltic maritime Powers in the study of North European seas, has in the present day led to advances which in their way are scarcely less epoch-making than those of the *Challenger*.

Prof. Krümmel is by no means content with quoting the work of his predecessors. He has repeated and checked by new methods and with additional data a large number of the measurements and calculations of Sir John Murray and others; he has tested apparatus and experimented with new methods; and by the practical experience thus gained, he sometimes finds it possible to reconcile theories which their promoters believed to be discordant, and to suggest reasonable concessions which save important pieces of original work from the possibility of being mutually destructive.

Detailed analysis or criticism would be out of place here; indeed, the former is practically impossible, because the whole work is so concise and closely knit that a fair idea of it could not be presented in smaller compass, and although there are a few points, such as the great divisions of the ocean in which we are inclined to differ from the author, and a few more in which we might venture to amend his

classifications, these are few indeed compared with the points on which we are in full agreement, and to point them out would give them undue prominence. Taken as a whole, Prof. Krümmel has acquitted himself of an enormously laborious and very difficult task with great acceptance and high distinction, and we look forward with the greater eagerness to the second volume, which we hope will not be long delayed.

H. R. M.

### SHORT NOTICES.

*Europe.*—‘La France à Volo d’Oiseau.’ By Onésime Reclus. (Paris: Flammarion. [n.d.] Two vols. Pp. 556, 559. 10 francs.) This is a topographical description of the whole of France, of no great depth, but well classified, according to the old territorial and physical divisions which appear so faintly on most modern maps beneath the coloured network of the modern departments, that they are liable to be forgotten by English students. Yet France is fortunate in the possession of these divisions, which, in usage of this sort, are far preferable to the departments, although these have borrowed physical names. It is to be fully realized, from M. Reclus’s writing, how perfectly the French language suits a work of this sort. It would never become tiresome to read.

‘La Suisse au XX<sup>e</sup> Siècle. Étude économique et sociale.’ By Pierre Clerget. (Paris: Armand Colin. 1908. Pp. 268. *Maps and Diagrams*. 3 fr. 50 c.) This review of the economical and social conditions of Switzerland has its chief geographical interest in the first section of the first chapter (which follows a long introduction). Here we find a regional division of Switzerland between the Alps, the Jura, and the plateau, and the significance of this division, and its influence on the population, their languages, customs, etc., is very clearly set forth. It is a most valuable and analytical chapter, assuming a sufficient intimacy of the reader with the country. One may study with interest a diagram showing the movement, according to season, of the inhabitants of an Alpine village, from the high Alps in summer to the valley in winter. Statistics are judiciously used, and their purport carefully explained. Throughout the book authorities quoted are acknowledged.

‘Mediterranean Winter Resorts.’ By E. Reynolds-Ball. (London: Hazell, Watson, & Viney. 1908. Pp. xxiii., 646. *Map*.) The sixth edition of this well-known work has received notable corrections and additions. The convenience of a single volume (it is actually two volumes in one) which covers a natural region like the Mediterranean littoral so far as its health resorts are concerned, is obvious in contradistinction to guides which are arranged according to political divisions.

‘Guide to Greece, the Archipelago, Constantinople, the Coasts of Asia Minor, Crete, and Cyprus.’ (London: Macmillan. 1908. Pp. xlix., 226. *Maps and Plans*. 9s.) This is another new edition of a well-known guide-book which first appeared under the title of the ‘Eastern Mediterranean.’ It is a model of clear printing and excellent arrangement, and the high authorities whose names are quoted in the preface should be evidence of its accuracy as regards archaeological and other information of a highly specialized character.

*Africa.*—‘Guide to Egypt and the Sûdan.’ Fifth Edit. (London: Macmillan, 1908. Pp. xvi., 177. *Maps*. 5s. net.) Every new subject appears to have been added to this well-known guide in order to bring its new edition up to date. The journey through the Sudan and Uganda to Mombasa is included.

‘A Hausa Reading Book, containing a collection of texts reproduced in facsimile from native manuscripts, arranged for the use of beginners and advanced students, with transliterations into Roman characters; translations, notes, etc.’ By

Captain L. Charlton. (London: H. Frowde. 1908. Pp. 83 and 45. *Price 4s. 6d. net.*) This little book will be a valuable aid to students of the Hausa language. Besides supplying a guide to transliteration from the Hausa script, it carefully elucidates points of grammar by means of footnotes.

'The Congo State: its origin, rights, and duties. The charges of its critics.' By A. Castelein, s.j. (London: D. Nutt. 1908. Pp. 274. *Price 3s.*) The author claims to have made an impartial study of the Congo question, his object being "to fix by the light of principles and facts the genesis of the right of sovereignty exercised by the Congo State, as well as the nature of the principal rights and the principal duties which it involves." His conclusions are on the whole favourable to the existing régime.

*America.*—'Journneys of Observation.' By T. A. Rickard. (San Francisco: Dewey Publishing Co. 1907. Pp. xvi., 255, 130. *Illustr.*) This sumptuous volume, beautifully illustrated, "records the observations made by a traveller, who happened to be a mining engineer." It is divided into two parts, the first dealing with Mexican mines, the second with south-western Colorado. The primary interests are mining and mineralogy, but these so closely involve topographical and geographical studies that the book is capable of appeal to non-technical readers.

*General.*—'The Camper's Handbook.' By T. H. Holding. (London: Simpkin, Marshall. 1908. Pp. 400, with appendix and index unpagged. *Illustr.* 5s. *net.*) A handbook on camping is no doubt liable to rough usage, and the poor appearance of this book is justifiable on that ground. But the matter appears excellent, and it would be difficult to believe that any conceivable aspect of camping as a recreation, or any subject connected with it, is omitted.

## THE MONTHLY RECORD.

### EUROPE.

**Diminution of the Mer de Glace.**—While the data respecting the advance or retreat of glaciers are usually restricted to a measurement of their longitudinal variations, exact measurements of the "ablation," or fall of level of the Mer de Glace, have been made during the past fifteen years by M. J. Vallot, who gives a note on the subject in the *Comptes Rendus* of the Paris Academy of Sciences for June 22, 1908. By a study of the moraines, and by inquiry among the inhabitants of the neighbourhood, he has also made an approximate estimate of the amount lost since 1850, the date of the last maximum. It appears that in the case of four cross-sections, between the altitudes of 1550 and 1920 metres, the mean fall of level in a period of thirteen to fifteen years has varied between 11 and 29 metres, the greatest amount of course corresponding with the lowest altitude. The actually ascertained fall of level in the above-named period seems to bear a proportion of from 20 to 40 per cent. to the total since 1850. In the comparatively level portion between the Echelets and Montanvert there has been an approximate ablation of over 50 metres in the fifty-seven years 1850-1907. This being about one-eighth of the total which has occurred since the glacial epoch, M. Vallot asks whether much that has been said on the subject of the latter may not have been considerably exaggerated.

**The Plant Formations of the Færoes.**—In Part III. of 'The Botany of the Færoes,' published at Copenhagen with the aid of the Carlsberg Fund, Mr. C. H.

Ostenfeld gives an interesting account of "The Land Vegetation of the Færoes," dealing both with the general relations of the vegetation to external conditions, and with the special plant-formations represented. The paper has also been issued separately (Copenhagen: H. H. Thiele, 1908). Foremost of the natural conditions affecting vegetation is of course climate. In the Færoes the variations of temperature are remarkably small, for there is no excessive cold in winter, while in summer again the temperature is rather low. The abundant humidity, both of the air and soil, renders special adaptations to drought unnecessary. Few data have hitherto been available respecting the snow-covering, but some careful observations by Dr. Knud Poulsen during the two winters spent at Thorshavn enable Mr. Ostenfeld to present a sketch of the general conditions, which brings out the fact that, in the lower grounds at least, the snow never lies long, the prominent feature being the frequent and rapid changes between snow, thaw, and black frost. The snow-covering, therefore, does little to protect the vegetation. On the other hand, the influence of the wind is great, both in its dwarfing effect in the plants (especially in the wind-swept depressions called "Eider"), and, sometimes in the entire removal of the surface covering of soil. Owing to the frequency of fog, the general cloudiness, and the low angle of incidence of the sun's rays, the plants do not enjoy a large amount of light, though in the absence of forests they get the benefit of all that is available. Exposure plays an important part in differentiating the formations. The soil, formed by the decomposition of basalt, is generally favourable to plant growth. Owing to the abundant moisture, peaty soil plays an important part. Altitude is of less importance in the Færoes than in many countries, as, owing to the temperate insular climate, the more common mountain plants can also thrive in the lowlands. True mountain plants only amount to about one-ninth of the total, while the lowland flora comprises about two-thirds of the whole. In defining the formations, Mr. Ostenfeld distinguishes, firstly, between natural and cultivated formations; secondly, between halophile and inland; and thirdly, between formations of the lower regions and of the mountains. Over twenty in all are described, some of which are further subdivided in considerable detail. The cliff formation, *e.g.*, includes a series ranging from the vertical cliff-wall with its covering of lichens to the sheltered "giov," or ravine, with its terraces luxuriantly clothed. On the mountain plateaux the most widely distributed formation is that of the rock-flats, barren expanses in which the rocks stand out like islets in a sea of gravel, relieved here and there by a few plants. In the cultivated area the most important formation is that of the "bø," or grass meadow, the process of formation of which is described in detail. New land is generally first planted with potatoes for two years, barley (or rarely oats) being sown the third year, mixed with a small quantity of grass seed. After this the meadow with a wealth of flowering herbs is gradually developed, the perennials ousting the annual weeds which appear in the early stages.

The Geography of the Steigerwald is the subject of a monograph by Dr. J. Schwender in the *Forschungen zur deutschen Landes- und Volkskunde* (vol. 17, No. 1). The existing aids for such a study were fewer than in the case of some regions, and the author is to be congratulated on the amount and value of the material he has amassed in two months' wanderings in the region, the results of which he has supplemented by a careful use of cadastral maps. A history of the course of settlement, contemplated in the original plan, had to be abandoned, while it was not possible to show the altitudinal contours on the maps. Falling within three administrative districts, the upland called the Steigerwald runs north-north-east between the Main, Aisch, and Regnitz rivers in Franconia. On the west and north it falls away steeply to the Main. On the south and south-east it is bounded by the Uffenheim depression and the Aisch river. Further north the

eastern frontier, in the absence of a determinate geological or orographical boundary, is somewhat arbitrary. Leaving the Aisch valley at Ühlfeld, it runs north *via* Wachenroth, etc., to Ross-stadt on the Main. Substantially within these borders, but with occasional slight projections and recessions therefrom, the Steigerwald constitutes a well-defined, compact region of fully 550 square miles, with but 73,586 inhabitants. Leaving out the forest area, 35·4 per cent. of the whole, the population on the plain still amounts to only 205 to the square mile. Corresponding to its geological history, the Steigerwald consists of (1) the wall-like edge on the west and north-west, with the level land fronting it; (2) the eastern declivity, shelving off slowly eastwards and intersected by numerous streams. The higher border presents no striking elevations or depressions, but its middle part, 1500–1600 feet high, is marked by such summits as the Geiersberg, Schlossberg, etc. The southern border from the Schwanberg (1580 feet) to the Frankenberg (1460 feet) shows greater variations. Like its main divisions, the Steigerwald as a whole splits naturally into a north, middle, and southern section. Its waters all flow north, west, and east, direct or by the Regnitz to the Main. The chief watershed, running at a nearly uniform height from south-south-west to north-north-east, is pierced by the Rauhe Ebrach and an affluent of the Bibart, both descending from the western slope. Economically, the Steigerwald comprises agriculture, cattle-rearing, and forest culture, 44·2 per cent. of the total area being arable, 9·8 per cent. meadow, and 3·1 per cent. pasture land. Increasing in area from north to south, the arable land is most extensive in the good level soil of the south, wheat being its chief crop. The north part, on the east as on the west side, has the least percentage of agriculture, but viticulture is a prominent feature. Cattle-rearing is well developed both as regards the number and quality of the stock, but less in the west than on the eastern slope. Forest culture is the next most important source of revenue. Clear and precise tables show the respective areas of the north, middle, and south parts of the Steigerwald; their distribution in plough land, vineyard, meadow, forest, etc.; and their respective stocks of horses, cattle, sheep, swine, and goats. The bulk, however, and most interesting part of the monograph is that concerned with the anthropogeography.

#### ASIA.

**The Baghdad Railway.**—The construction of a new section of this railway—from the present terminus at Bugurlu, a little beyond Ereğli, to Helif, in northern Mesopotamia—is provided for by an agreement arrived at early in June between the Anatolian Railway and the Turkish Government. Bugurlu lies at the north-western foot of the Taurus, the crossing of which range, and especially the descent to the plains on the southern side, will involve considerable engineering difficulties. From a note in *Globus* (vol. 94, No. 2), we learn that thirty tunnels will be necessary on this section. After skirting the Bay of Alexandretta, the line will cross the Amanus, and at Tel Habesh, 50 miles north of Aleppo, will eventually be connected with the line under construction by a French company from Damascus to Aleppo. Hence it will be continued eastward, crossing the Euphrates south of Birejik, and reaching Helif, south of Mardin, by way of Harran.

**The Hejaz Railway.**—Reference was made to this important undertaking in the *Journal* for 1906 (vol. 27, p. 633). The second part of the memoir descriptive of the line, by Auler Pasha, has now been issued as *Ergänzungsheft* No. 161 to *Petermanns Mittheilungen*. It is illustrated with numerous photographs, which give characteristic representations of the remarkable country through which the railway runs, and a map showing the course of the line itself, on a fairly large scale, from Ma'an to El 'Ula, and another in outline of the old trade routes which centuries

ago traversed Asia Minor, Arabia, and Mesopotamia. The entire length of the Hejaz line, as far as completed, from Damascus to El 'Ula, is 980 kilometres, and roughly this may be said to be three-quarters of the entire distance from Damascus to Medinah. From Medinah to Mecca two lines would appear to have been in contemplation, but that hugging the coast is the one finally decided upon. It is expected to be completed in 1910, and the length will be about 450 kilometres, or 281 miles, according to a report made by the engineer, Haji Muchtar Bey, who followed the pilgrim route from Medina to Rebigh on the Red sea, and thence to Mecca. He further states that there are no special difficulties in the shape of mountains or rivers. Auler Pasha's monograph makes interesting reference to the work and discoveries of previous explorers in these regions, particularly Charles Doughty, Hüber, and Euting. The researches of these proved that the old trade route between East and West, in some respects coinciding with the trend of the new railway line, brought the products of China, the Moluccas, and East Indies, gold from the Zambezi, frankincense from South Arabia, etc., on camel-back through two intermediate sets of hands on its way to the north: (1) In the southern section of the route from Cane Emporium in southern Arabia to El 'Ula, through the hands of the Himyarites or Sabæans; and (2) in the northern section from El Hejr, past Ma'an, to Petra, through the hands of the Nabateans. From the last-mentioned emporium the caravans separated, some going west to Gaza and Alexandria, and some northwards to Damascus and thence to Byzantium. This was the chief commercial route between 800 B.C. and 109 A.D., in which year Trajan's general, Cornelius Palma, made a cruel end of the Nabateans, and the trade of Eastern Asia diverged towards the Persian gulf, and thence across the desert to Palmyra. Auler Pasha entertains no doubt that El 'Ula was the northernmost trading station or factory of the Sabæans, and El Hejr the southernmost of the Nabateans. The author adds that it is a most interesting coincidence that, after an interval of nearly 2000 years, these two great historic highways of commerce should be in process of being revived and reorganized, that of the Sabæans and Nabateans through the Hejaz railway, and that of the Persian gulf, Palmyra, and Byzantium through the Baghdad railway. It is necessary to point out that in the general map illustrating the whole region from Damascus to Mecca, the parallels of latitude are marked wrongly, the effect being to throw the position of any place one might wish to fix or refer to 2° too far south.

**Dr. Sven Hedin.**—No direct news from this traveller appears to have been received in Europe since the end of last year, when letters despatched from Gartok early in October reported his intention of starting immediately for Ladakh and Khotan (*Journal*, vol. 31, pp. 216, 333). Some anxiety seems to have been felt in Sweden owing to the absence of news, but a telegram dated Simla, July 29, reported that a caravan from Lhasa had arrived at Leh, bringing a letter written by one of the explorer's servants, which stated that he himself was well, and his caravan in good condition. No information as to his movements was, however, given.

#### AFRICA.

**The Duke of Mecklenburg's Expedition across Africa.**—The Duke of Mecklenburg has returned to Germany after successfully completing his expedition to the West Coast by way of the Congo (*Journal*, vol. 31, p. 445; 32, p. 86). Further accounts of the experiences of the Duke and his companions are given in the *Deutsches Kolonialblatt*, July 15, 1908. During the land journey to Avakubi, where regular navigation of the Uruwimi begins, another okapi skin was obtained from the Mombutti dwarfs. In addition to the names Okapi (or

Kwapi) and Kenge, which are most commonly used for the animal, the name Alabi was also heard. "Kenge," which was not heard till Irumu was reached, is applied in some districts to the "soli," the great striped antelope, of which a specimen had been previously secured (*ante*, p. 87). A fine collection of birds was obtained, as well as many specimens of invertebrates and interesting forms of fish from the Ituri; but after the river journey had been begun at Avakubi the fauna became much scarcer. Whereas at Beni and the districts bordering the forest on the east, the months from February to May are considered the wettest, in the Ituri forest the greatest precipitation is said to occur between August and October. The voyage down the Aruwimi was made at the time of the lesser rains (end of April), and the river, of which the breadth varied from 400 to 1000 yards, had risen in consequence some 3 feet. The cataract at Panga, which is impassable by boats, presented an imposing spectacle. A report by the geologist, Dr. Kirschstein, who had remained behind to complete his study of the volcanoes, records a serious disaster to his party on Karisimbi. During an ascent in February he had discovered a previously undescribed crater, about a mile in diameter, on the south-east side. He was preparing to descend the mountain, when his party was assailed by a furious snowstorm, to which half of his men succumbed—the fatalism of the negro making it impossible to induce them to struggle on to a place of shelter. Some of the earlier reports of the scientific experts, printed in the *Mitteilungen a. d. Deutschen Schutzgebieten* (1908, No. 2) may here be referred to. Among the pieces of work accomplished by the topographer, Lieut. Weiss, was the trigonometrical and topographical survey of the region of the Kagera, etc.; a large number of astronomical observations at Kissenye on Lake Kivu; and a detailed survey of the region of the volcanoes. The new volcano near the north end of Kivu, which originated in May, 1905, was ascended in company with Dr. Kirschstein, and its position and topography determined. Dr. Schubotz, the zoologist, gives some interesting notes on the faunal distribution, the regional variation of forms having been studied with much care. Some of the results were unexpected, especially as regards the fauna of the waters examined. *Hirudines* and *Turbellaria* were observed in great numbers, and *Planaria*, which Stuhlmann had found in none of the streams flowing to the Nile, were obtained in plenty in the head-streams of the Kagera, but not in Kivu. The general poverty of the fauna of this lake points to its recent origin. On Karisimbi traces of mammals (elephant, leopard, etc.) were seen up to 4000 metres (over 13,000 feet), while birds were not found above 3500 metres. The volcanoes form a marked dividing line between the regions on either side, a typical steppe-fauna, remarkably rich in antelopes, making its appearance to the north. In the eastern part of the Congo forest howling monkeys, parrots, turacos, etc., are much in evidence, and the character of the fauna already shows its West African affinities. Lastly, Dr. Mildbread's report gives details respecting the flora of the volcanoes and of the eastern Congo forest. Of the former, distinct differences seem to exist between the individual peaks. Niragongo, *e.g.*, seems marked by a scarcity of bamboos, forests of which clothe the base of the others.

**Explorations in the Kamerun.**—Baron von Stein, whose journeys in the Kamerun during the past dozen years have done so much to throw light on the interior of the territory, has lately carried out another important expedition through some of the little-known districts on the upper Sanaga and between this stream and the Wuri. Starting from the Yaunde station in January, 1907, the traveller went north by a hitherto unsurveyed route through the habitat of the Mpangwe peoples, crossing the hilly zone forming the water-parting between the Nyong and the Sanaga, and entering a more level country, which begins to show more of the

character of the grass-lands to the north. From the district of the Etun (one of the Mpangwe group of tribes), the expedition entered that of the Baki, who speak a different language from the Mpangwe, and showed themselves more or less hostile. They are rather fishers than hunters, and show much skill in the building of canoes. The Sanaga, which was crossed a little above the mouth of its northern tributary, the Mbam, is much more obstructed by falls and rocks than the Nyong, at the same distance from the coast. A good deal of gallery forest is found in this region. Baron von Stein ascended the Mbam, which had previously been imperfectly known for some distance to the north, crossing its tributary the Njim with some difficulty. The expedition now met with increased difficulties, desertions of porters being a constant occurrence, and this state of things continued during a great part of the journey. The Mbam was crossed near the Garima falls, and the little-known Bafia country was then entered. The Bafia people showed much distrust, and hostilities were avoided with difficulty. Their country differs a good deal from other districts. In the east and south-east it is flat, but in the north and west it is mountainous. It is generally thickly peopled, and the people differ much from their neighbours in speech, manners, and customs, showing more resemblance with those of the north of the Kamerun. It was impossible to continue the westerly march in the desired direction, midway between the Sanaga and the route of Lieut. Schimmelpfennig some years previously, and it was necessary to bend southward to the Sanaga, afterwards returning north near the frontier of the Bakoka peoples. On reaching this a sudden change took place in the country, from plain to mountain, and from grass-land to forest. The cultivation of oil palms was observed, and landolphas and kiksias were seen. Elephants seemed still fairly abundant. The zone of Mohammedan influence was here left, and the people were easier to deal with. The going, however, was very bad for the porters, though progress became more rapid when the forest region proper was reached. The valleys of several tributaries of the Sanaga were crossed, and the upper basin of the Dibamba, which had previously been almost unknown, was entered. One of the main upper branches is the Ebo, which has hitherto been confused with the Ekem. The middle course of the Dibamba, below the junction of the various upper branches, is much broken by falls. Hereabouts the influence of the Duala traders from the coast began to be observable, and progress became easier. As a result of the expedition it is probable that they will extend their operations still further eastwards, not altogether, perhaps, to the benefit of the indigenous populations. According to the traveller's reports, a good deal remains to be done before the regions traversed can be successfully brought under control.

**Minerals in Northern Nigeria.**—The results of the mineral survey of Northern Nigeria during the years 1904-6 are given in *Colonial Reports—Miscellaneous*, Nos. 46 and 47. In Bassa province is a band of metamorphic rocks, adjacent to the Niger, not more than 5 to 6 miles wide, stretching from Kpata to Itobi, in which pegmatites are of frequent occurrence. They contain mica, but in plates too small to be of economic value. At Igbo, within a mile of the river, there are bands, 3 to 4 feet thick, of crystalline limestone likely to prove valuable as a source of lime. Iron-stone concretions occur in the Bassa ferruginous sandstone, but too sporadically to be of value as an iron ore. In Kabba province iron ore appears to abound, occurring as masses of magnetite near Anom, and limonite of sedimentary origin in the neighbourhood of Lampechi. In the concentrates obtained from the stream deposits rich samples of monazite are occasionally found. The rocks (mostly crystalline), of Illorin province, constitute a westerly extension of the rocks of Kabba province. Monazite is occasionally traceable in the stream deposits of Illorin, and a small stream near Aietu shows a notable quantity of it. Nupe province is

in greater part covered by reddish grits, and discloses no minerals of economic importance. In Nassarawa province magnetite abounds in the stream deposits east of Abuju. Monazite is also traceable among the stream deposits. It becomes more abundant in the vicinity of Aribi, and is noticeable in the river Gurara at Gantam, while further north there are indications of its wider distribution. Much iron is made by the natives in the Koro and Jaba countries from concretionary iron ore. A specimen of talc was found near Lampai. Altogether, monazite is very widely distributed in the Protectorate, but it has yet to be seen whether there are natural deposits rich enough to repay exploitation. Limonite ores, easy to quarry, at Akwa, Ojerami, and Jakura, 30 miles from the Niger, contain 54 to 56 per cent. of iron. West of Kuka and 70 miles from Lake Chad is an area of about 500 square miles, partly in French territory, containing earth from which salt—"ordinary" and "Sherri" manga—is extracted. Vegetable salt is also obtained from the ash of *Salvadora persica*, common on the banks of Lake Chad. The most important sources of salt are the springs at Awe, Azari, etc.

The Southern Railway in German South-West Africa reached its terminus at Keetmanshoop in June last, and though a good deal remains to be done before the line is completely finished, it is now possible for traffic to be carried on in a provisional way. The line, which leaves the coast at Lüderitz bay, was begun in December, 1905, the first section of 140 kilometres being provisionally opened to traffic in October, 1906. The total length is 366 kilometres, or about 230 miles.

#### AMERICA.

**The Canada-United States Boundary.**—By a treaty signed at Washington on April 11, 1908, and ratified on June 4 following, provision has been made for the demarcation anew of the frontier between Canada and the United States throughout its whole length. The treaty treats of the boundary in eight different sections, the procedure to be adopted varying somewhat according to the special circumstances of the several cases. Thus while in some cases the line has long been definitely marked by monuments, in others it has merely been laid down on charts, while in others, again, some doubt exists as to the precise line which ought to be followed. In certain cases steps have been taken within recent years to complete the demarcation, and the commissions which have been charged with the work will continue to act. As a general principle, it is recognized throughout that the decisions arrived at by previous treaties, from 1783 onwards, are to remain valid, while in cases of doubt as to the intentions of these, attention is to be paid to action by either Government or by local governments on either side of the line which may tend towards their interpretation. Deliberate rectifications of frontier to the advantage of either party are thus almost entirely excluded, and possible deviations from the strict letter of previous agreements are practically limited to cases where the course of the line has been established by mutual recognition and acquiescence. In the case of six out of the eight sections, the work of survey and demarcation is entrusted to two expert geographers or surveyors, one for each contracting party, but it is understood that the same persons will be appointed for the whole of the operations, unless there shall appear, in any case, to be a special reason to the contrary. For the section between the intersection with the St. Lawrence and the mouth of Pigeon river, on the western shore of Lake Superior, the re-establishment of the boundary is left in the hands of the International Waterways Commission; while as regards the boundary from the summit of the Rocky mountains to the Gulf of Georgia, the work will be done by the commissioners already designated by concurrent action of the two Governments in 1902 and 1903. In all cases the

line adopted is to be laid down in quadruplicate sets of accurate modern maps or charts, and the work done by the commissions to be described in duplicate in a joint report. It is unnecessary here to describe the special provisions for the separate sections, but attention may be called to one or two cases in which the acceptance of a definite line may involve difficulties. In Passamaquoddy bay, the commissioners appointed under the treaty of 1892 failed to agree in respect of a small part of the line on either side of Lubec Narrows channel, and the possibility of a similar disagreement during the procedure under the present treaty is provided for. In this, as in other possible cases of dispute, the decision is to rest with an arbitrator, to be appointed either by a third Power agreed upon by the two parties, or jointly by two Powers to be selected by the two parties respectively. As regards the St. Croix river, the centre of which forms the boundary from mouth to source, a difficulty may arise in the case of divergent branches forming islands in its course. The national character of such islands already established will determine the branch to be followed, but where this is in dispute, recourse may again be had to arbitration. A somewhat similar state of things exists in the case of the boundary between Lake Superior and the Lake of the Woods, which again follows waterways, and which has never been actually located or monumented by joint action of the two Governments.

**Exploration in Dutch Guiana.**—During the past eight years a succession of expeditions have been carried out, under the auspices of the Royal Netherlands Geographical Society in association with other bodies, for the scientific exploration of the interior of Dutch Guiana. Several of these have from time to time been referred to in the *Journal*. A concise statement of the work accomplished by the several expeditions, with the names of the leaders and references to the published accounts, is given in the *Tijdschrift* of the Netherlands Geographical Society for May last. As a rule, each expedition has taken in hand the examination of one or more of the various river systems of the colony (Koppename, Saramakka, Gonini, Tapanahoni, etc.), while attention has also been paid to ethnographic and other research. The expedition of 1907, in the direction of the Tumuc Humac range, has been described in the same *Tijdschrift* for January of this year. The leader was Mr. C. H. de Goeje, and it may be regarded as having completed the work of the Gonini and Tapanahoni expeditions. Still another expedition has been despatched during the present season, under the command of Lieut. Eilerts de Haan. Its field of action is at the opposite end of the colony to that of 1907, viz. the almost unknown south-west corner, where the upper basin of the Surinam river and the mountain range which forms its watershed need to be explored. The exploration of the upper Corentyn, on the frontier of British Guiana, will perhaps be the task of yet another expedition.

#### AUSTRALASIA AND PACIFIC ISLANDS.

**Expedition to the Southern Islands of New Zealand.**—The various small islands in the ocean south of New Zealand possess a considerable interest from the point of view of biological distribution from the fact that they form part of the few and small land areas which exist in the zone of transition between the temperate and Antarctic regions. Some interesting facts respecting their botany, collected by Dr. L. Cockayne during a winter expedition in 1903, were referred to in the *Journal* during 1905 (vol. 25, p. 461). Further research in this direction, as well as in other branches of science,\* was carried out at the end of 1907 by an expedition, in which Dr. Cockayne once more took part, undertaken under Government auspices,

\* Magnetic observations were one of the chief objects.

in association with the Canterbury Philosophic Society. Extracts from narratives published by the New Zealand press have lately appeared in the *Kew Bulletin* (1908, No. 6). The voyage was made in the *Hinemoa*, Captain Bellons, one of the vessels which periodically visit the islands in search of castaways (wrecks on their coasts being no uncommon occurrence), and the scientific experts were divided into two parties, one for the Auckland, and the other for the Campbell islands. One of the narratives is by Captain Dorrien Smith, a member of the former party. After touching at Port Pegasus, near the south end of Stewart island, the *Hinemoa* visited the Snares, 60 miles to the south-west, and the writer gives some interesting notes on the flora and fauna of these wind-swept islets, surrounded by the wide expanse of the Southern Ocean. They are composed of basalt rising some 500 feet, with precipitous cliffs. A large part of the surface is covered with semi-prostrate scrub, and there are in all only about thirteen species of plants on the islands. Bird-life is, however, described as wonderful, and it includes many flightless forms, specimens of which were captured by means of a long-handled landing-net. At the Auklands, the survivors of a shipwrecked crew were rescued, and a vivid description is given of their adventures and sufferings on Disappointment island, where the four-masted barque *Dundonald* had been wrecked on March 7, 1907. Carnley harbour is described as magnificent, and the scenery as very fine, the hills rising abruptly to 2000 feet. The "Rata" (*Metrosideros lucida*) dominates the lower zone, above which the tussock grass (*Danthonia*) and *Suttonia divaricata* are prominent, the *Suttonia* being almost impenetrable. *Olearia Lyalli* (which was common on the Snares) seems to have been almost choked out by the Rata. The birds (petrels, shags, etc.) were remarkably tame. The geologists made discoveries of ancient sedimentary rocks, which are important as supporting the belief in the former existence of a great sub-Antarctic continent. Extracts from Dr. Cockayne's narrative supply a further account of the Snares, besides summarizing the general characteristics of the vegetation of the southern islands. This observer points out that the character of the flora and fauna (which include forms of very limited distribution) agrees with the notion that the islands are scanty remnants of a once greatly larger land area. Reproductions of photographs by Captain Dorrien Smith, illustrating the flora, are given.

#### POLAR REGIONS.

**Dr. Charcot's Antarctic Expedition.**—The French expedition to Antarctic regions, under the command of Dr. Charcot, left Havre on August 15 in the *Pourquoi Pas*. Dr. Charcot expects to be absent about two years. One of his objects in returning to the regions of the South Pole is to bring back specimens of the fossils to which Dr. Nordenskjöld has already directed attention. He intends to transport them to one of the open ports of the Antarctic continent, either Port Lockroy or Port Charcot, and then to go on to Loubet Land to begin his exploration of the regions to the south. He has taken with him provisions for twenty persons for more than two years. The *Pourquoi Pas* is expected to arrive face to face with the southern ice about December 15, at about 800 kilometres south of Cape Horn. Six automobile sleds will, it is hoped, enable the expedition to make its way well into the interior along the glaciers, and supplement the services rendered by the skis.

**The Erichsen Expedition to East Greenland.**—We regret to state that a serious disaster has occurred to this expedition, which, it will be remembered, set out from Copenhagen in June, 1906, for the purpose of exploration on the unknown part of the Greenland coast north of Cape Bismarck, and research in the adjoining region. The surviving members of the Expedition arrived at Bergen on August 15,

and Lieut. Trolle, master of the *Denmark*, the vessel of the expedition, has given particulars of the lamentable death of the leader and his two companions. It appears from a Reuter message that a harbour for the ship was found in latitude  $76\frac{3}{4}^{\circ}$ . Mr. Erichsen, Lieut. Hagen, and Mr. Brönlund perished in November, 1907, in an attempt to return from the north coast of Greenland over the inland ice, having been obliged to remain on the north coast through the summer, owing to the state of the weather. A sledge expedition was organized in the spring of 1907, under the command of Mylius Erichsen, to explore the unknown part of the north-east coast of Greenland. The expedition consisted of ten sledges in four batches. Three of these returned before the beginning of summer, and in September, 1907, an expedition was sent out to find the fourth party, which had not returned. At  $80^{\circ}$  the expedition found open sea close to the coast. In the course of the autumn numerous sledge expeditions started, and in March, 1908, a fresh rescue party set out, which brought back definite news of the fate of the missing sledge party. During the spring several other sledge journeys were made on the inland ice towards the south, as far as Ardencaple. The coast of Greenland was explored as far as Cape Bridgman,  $83\frac{1}{2}^{\circ}$ , and into Peary channel to Cape Glacier. The coast line took a much more easterly direction than was expected, and connection was made with Peary's landmark on Peary Land. At Cape Glacier the Danish flag was hoisted, and the country taken possession of for Denmark, and called King Frederic VIII. Land. No living people were encountered. Scientific expeditions were continuously made into the district surrounding Port Denmark, and also from the ship. On the road large collections were made, and a mass of scientific material was collected; numerous sketches, paintings, and photographs of the country were also made.

#### MATHEMATICAL AND PHYSICAL GEOGRAPHY.

**Cones formed by Melting Snow.**—Examples of a peculiar surface form, due in part to the melting of snow, are described from Iceland and the Alps respectively by Herr Spethmann and Prof. Brückner in the *Zeitschrift für Gletscherkunde*, vol. 2, pt. 4. The resemblance of the fields of snow-cones, of which photographs are given, to the *nieve penitente* of tropical regions is sufficiently great to suggest a similar origin, though this is not pressed by either of the writers; in fact, Herr Spethmann considers the phenomenon in Iceland to be not entirely analogous with that in the Alps even. The fields which he observed during his recent expedition to Iceland (cf. *Journal*, vol. 31, p. 672) consisted of cones varying in height from half an inch to about 18 inches, and were covered with a layer of volcanic dust, etc., which quite concealed the consolidated snow beneath. They occurred on level or gently sloping ground, and appeared to be in no way dependent on the orientation of the latter. The angle of slope of the individual cones sometimes reached  $45^{\circ}$ . From the fact that, where not covered with earthy matter, the snow showed few, if any, irregularities, Herr Spethmann concludes that the cone formation is entirely due to the deposition of the dust by the wind and the development on its surface of ripple marks, which lead to a differential melting of the snow beneath. Prof. Brückner's example is from the Rhone glacier, and shows equally the effect of an original ripple-marking of a layer of dust above the snow.

#### GENERAL.

**The Cartographer Tomas Lopez.**—A biography of this Spanish cartographer, embodying the results of much original research, and affording an interesting glimpse into the development of cartography in Spain, has been supplied by M. G. Marcel in the *Revue Hispanique* (vol. 16), in a paper since separately published (New York, Paris: 1907). The biography is supplemented

by a list of the maps of Lopez, including many maps not entered in Colonel Prudent's list (in the *Annales de Géographie*, November 15, 1904) of the maps constituting Lopez' atlas. Born at Madrid December 21, 1731, Lopez, under favour of the Prime Minister of Spain, passed, in 1752, through a course of mathematics in the Imperial College, and the same year, under the administration of Spain's large-minded statesman, was, with three other youths, sent to Paris to learn the art of engraving maps. In Paris he completed three courses in mathematics, attending the lectures of Abbé de la Caille, frequenting the studio of D'Arville, where probably he made the acquaintance of Guillaume Delahaye, D'Anville's engraver. In Paris, where he resided till 1760, Lopez brought out a series of maps of no especial merit, and, returning to Madrid, published, in 1761, maps of Jaen, Granada, and Cordova, and in 1762 (*inter alia*) an Atlas of Spain and Portugal, and a map of Louisiana (then being ceded to Spain). Of more importance was a work published in 1763—'Description de la provincia de Madrid'—a volume of over 200 pages, with a map designed after the great map of P. P. Martinez and de la Vega (1739-43). This great map was long held for lost, but a manuscript copy, measuring 7 feet each way, and presumably from the hand of Lopez, was produced at a meeting of the Madrid Geographical Society in 1904. M. Marcel, who was present at the meeting, communicates some interesting details respecting the map, discussing also the question who were the two original authors. The succeeding years, down to his death in 1802, are crowded with Lopez' labours, testifying to a remarkably expeditious and indefatigable industry. Out of the long list of his productions may be cited his 'Principios Geográficos aplicados al uso de los Mapos.' The second volume, not appearing till eight years later, includes an elucidation of the mariner's compass and its deviations, loxodromic lines, hydrographic maps, ancient measures, etc. About 1776, Lopez addressed a set of questions to the ecclesiastical functionaries, and another set to the intendants of Spain, with a view to the collection of information to be embodied in a geographical dictionary of Spain. These are given in an appendix. The general conclusion reached by M. Marcel is that, though not a geographer of the first rank, Lopez' services to the science are incontestable.

## GEOGRAPHICAL LITERATURE OF THE MONTH.

### *Additions to the Library.*

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.  
 Abh. = Abhandlungen.  
 Ann. = Annals, Annales, Annalen.  
 B. = Bulletin, Bollettino, Boletim.  
 Col. = Colonies.  
 Com. = Commerce.  
 C.R. = Comptes Rendus.  
 E. = Erdkunde.  
 G. = Geography, Géographie, Geografia.  
 Ges. = Gesellschaft.  
 I. = Institute, Institution.  
 Iz. = Izvestiya.  
 J. = Journal.  
 Jb. = Jahrbuch.  
 k.k. = kaiserlich und königlich.  
 M. = Mitteilungen.

Mag. = Magazine.  
 Mem. (Mém.) = Memoirs, Mémoires.  
 Met. (mét.) = Meteorological.  
 P. = Proceedings.  
 R. = Royal.  
 Rev. (Riv.) = Review, Revue, Rivista.  
 S. = Society, Société, Selakab.  
 Sc. = Science(s).  
 Sitzb. = Sitzungsbericht.  
 T. = Transactions.  
 Ts. = Tijdschrift, Tidskrift.  
 V. = Verein.  
 Verh. = Verhandlungen.  
 W. = Wissenschaft, and compounds.  
 Z. = Zeitschrift.  
 Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

### EUROPE.

#### Alps.

Coolidge.

The Alps in nature and history. By W. A. B. Coolidge. London: Methuen & Co., [1908]. Size 9 × 5½, pp. xx. and 440. *Maps and Illustrations.* Price 7s. 6d. net. *Presented by the Publishers.*

Instructive studies of the physical and historical aspects of the Alps as a whole.

#### Alps.

Dübi.

Conway and Coolidge's Climbers' Guides. The Bernese Oberland, vol. 4. Grimsel to the Uri Rothstock. By H. Dübi. 2 parts. London: T. Fisher Unwin, 1908. Size 5½ × 3, pp. (part 1) xx. and 112; (part 2) xxiv. and 132. Price 10s. net each part. *Presented by the Publisher.*

The guides belonging to this series are too well known to need a recommendation.

#### Alps.

Whymper.

The Valley of Zermatt and the Matterhorn. By Edward Whymper. 12th edit. Chamonix and the range of Mont Blanc. By the same. 13th edit. London: J. Murray, 1908. Size 7½ × 5, pp. (Zermatt, etc.) xvi. and 224; (Chamonix, etc.) xvi. and 206. *Maps, Plans, and Illustrations.* Price 3s. net per vol. *Presented by the Publisher.*

#### Europe.

Brachelli and Juraschek.

Die Staaten Europas. Statistische Darstellung begründet von Dr. H. F. Brachelli. Fünfte Auflage . . . herausgegeben von Dr. Franz von Juraschek. Leipzig, etc.: F. Irgang, 1907. Size 9 × 6, pp. vi., 996. Price 24s.

This standard work has been recast so as to suit the requirements of modern conditions.

#### France.

Miltoun.

Castles and chateaux of Old Navarre and the Basque Provinces, including also Foix, Roussillon, and Béarn. By Francis Miltoun. London: Sir I. Pitman & Sons, 1908. Size 8 × 5½, pp. xviii. and 456. *Map and Illustrations.* Price 7s. 6d. net. *Presented by the Publishers.*

#### Germany—Berlin.

Baeleker.

Berlin and its environs: handbook for travellers. By Karl Baeleker. 3rd edition. Leipzig. (London: Dulau & Co.), 1908. Size 6½ × 4, pp. x. and 248. *Maps and Plans.* Price 3s. *Two copies, presented by the Editor and Publishers.*

#### Italy—Venetia.

Magrini and others.

Reale Istituto Veneto di Scienze, etc. Ricerche Lagunari, per cura di G. P. Magrini, L. de Marchi e T. Gnesotto. No. 8, Osservazioni mareometriche lungo il litorale e in laguna (biennio 1906-1907) (pp. 52); No. 9, Impianti mareografici eseguiti (pp. 18); No. 10, Operazioni geodetiche fondamentali per il rilievo della città e laguna di Venezia eseguite dall' Istituto Geografico Militare, per incarico del Municipio di Venezia (pp. 64). Venice, 1908. Size 10½ × 7. *Diagrams and Illustrations.*

#### Norway—Glaciers.

Z. *Gletscherkunde* 2 (1908): 213-219.

Machaček.

Ueber Rückzugsmoränen in Norwegen. Von Fritz Machaček.

#### Russia.

Philippson.

Landeskunde des Europäischen Russlands nebst Finnland. Von Dr. Alfred Philippson. Leipzig: G. J. Göschen, 1908. Size 6 × 4, pp. 148. *Maps and Illustrations.* Price 80 pf. *Presented by the Publisher.*

One of the excellent series of handy geographical treatises known as the "Sammlung Göschen."

#### Russia—Finnland.

Scott.

Through Finland to St. Petersburg. By A. MacCullum Scott. London: Grant Richards, 1908. Size 7½ × 5, pp. x. and 292. *Map and Illustrations.* Price 2s. 6d. net. *Presented by the Publisher.*

**Russia—Orel.**

Jacobi.

*Zapiski Imp. Russ. G.S., Ethnography* 32 (1907): pp. xii., 196, and 1.The Viatiches of the Orel Government. By P. I. Yakobi. *Maps*.**South-East Europe.**

Windt.

Through savage Europe: being the narrative of a journey (undertaken as special correspondent of the *Westminster Gazette*) throughout the Balkan States and European Russia. By Harry de Windt. London: T. Fisher Unwin, [1908]. Size 9 × 5½, pp. 300. *Illustrations*. Price 10s. 6d. net. Presented by the Publisher.

**Sweden and Norway—Lapps.**

Wiklund.

De Svenska nomadlapparnas flyttningar till Norge i äldre och nyare tid. Af K. B. Wiklund. Upsala, 1908. Size 9 × 7½, pp. iv. and 248. Presented by the Royal University, Upsala.

On the migrations of the Lapps in ancient and modern times.

**Switzerland—Davos.**

Bach.

Das Klima von Davos, nach dem Beobachtungsmaterial der eidgenössischen meteorologischen Station in Davos. Von Dr. Hugo Bach. (*Neue Denkschriften der Schweizerischen Naturforschenden Gesellschaft*, Bd. xlii., Abh. 1.) Zürich, 1907. Size 11½ × 9½, pp. iv. and 106. *Diagrams*. Presented by the Author.

**Switzerland—Grisons.**

Schröter.

Das St. Antönierthal im Prättigau in seinen wirtschaftlichen und pflanzengeographischen Verhältnisse, dargestellt von Dr. C. Schröter. (Separat-Abdruck aus dem Landwirtschaftlichen Jahrbuch der Schweiz, ix. Band, 1895.) Zürich: Institut O. Füssli, [1895.; reprinted 1908]. Size 10 × 7, pp. 134–272. *Map and Illustrations*. Price 2m. 50. Presented by the Publishers.

An interesting regional study, treating in turn of the land, the people in their social and economic organization, and the vegetation features of the district.

**Switzerland—Phytogeography.**

Christ.

La flore de la Suisse et ses origines. Par H. Christ. Nouvelle édition, augmentée d'un aperçu des récents travaux géobotaniques. Basle, etc.: Georg et Cie., 1907. Size 9½ × 6, pp. xvi., 572, and 120. *Maps and Illustrations*. Price 13s.

The flora is described from a distinctly geographical view point.

**United Kingdom—Climatology.** *Scottish G. Mag.* 24 (1908): 169–186.

Watt.

The climate of the British Isles. By Andrew Watt. *Maps, Illustration, and Diagrams*.

**United Kingdom—Cornwall.**

Hudson.

The Land's End: a naturalist's impressions in West Cornwall. By W. H. Hudson. London: Hutchinson & Co., 1908. Size 9 × 5½, pp. viii. and 324. *Illustrations*. Price 10s. 6d. net. Presented by the Publishers.

**United Kingdom—Derbyshire, etc.**

Gibson and others.

Memoirs of the Geological Survey; England and Wales. Explanation of sheet 125. The geology of the southern part of the Derbyshire and Nottinghamshire Coalfield. By W. Gibson, T. I. Pocock, O. B. Webb, and R. L. Sherlock. London, 1908. Size 9½ × 6, pp. viii. and 200. *Sections*.

**United Kingdom—Grampians.**

Macnair.

The geology and scenery of the Grampians and the valley of Strathmore. By Peter Macnair. 2 vols. Glasgow: J. MacLehose & Sons, 1908. Size 9 × 6, pp. (vol. 1) xiv. and 196; (vol. 2) xii. and 200. *Maps, Sections, and Illustrations*. Price 21s. net. Presented by the Publishers.

**United Kingdom—London.**

Baedeker.

London and its environs. Handbook for travellers. By Karl Baedeker. Leipzig (London: Dulau & Co.), 1908. Size 6½ × 4, pp. xxxvi., 452, and 44. *Maps and Plans*. Price 6s. Presented by the Editor.

**United Kingdom—Meteorology.** *Symons's Meteorol. Mag.* 43 (1908): 65–74.

Mill.

The Easter snowstorm of 1908. (By Dr. H. R. Mill and others.) *Maps*.

**United Kingdom—Oxfordshire, etc.**

Pocock.

Memoirs of the Geological Survey: England and Wales. Explanation of special Oxford sheet. The geology of the country around Oxford. By T. I. Pocock. London, 1908. Size 9½ × 6, pp. vi. and 142. *Sections*.

**United Kingdom—Rainfall.** *Symons's Meteorol. Mag.* 43 (1908): 45-50. **Mill.**  
The geographical distribution of rainfall in the British Isles. By Dr. H. R. Mill.  
*Sketch-map.*

Outline of the lectures lately delivered at the Society.

**United Kingdom—Somerset, etc.** **Ussher.**

Memoirs of the Geological Survey: England and Wales. Explanation of sheet 295.  
The geology of the Quantock Hills and of Taunton and Bridgwater. By W. A. E.  
Ussher. London, 1908. Size  $9\frac{1}{2} \times 6$ , pp. iv. and 110. *Sketch-maps and Sections.*

**Western Europe—Meteorology.** *B.S. Languedoc. G.* 30 (1907): 333-348. **Sorre.**  
Sur un rythme des pluies dans la Méditerranée occidentale. Par Maximilien  
Sorre. *Diagrams.*

**Western Europe—Vosges.** **Grucker.**

Die Vogesen. Von Eduard Grucker. (Geographische Monographien . . .  
herausgegeben von A. Scobel, 22.) Bielefeld, etc.: Velhagen & Klasing, 1908.  
Size  $10 \times 7$ , pp. 170. *Map and Illustrations.* Price 4s.

### ASIA.

**Asia.** **Forrest.**

Selections from the travels and journals preserved in the Bombay Secretariat.  
Edited by George W. Forrest. Bombay, 1906. Size  $12\frac{1}{2} \times 9\frac{1}{2}$ , pp. xxviii, 304,  
and xxx. *Maps. Presented by the Bombay Secretariat.*

Mr. Forrest here prints a number of hitherto unpublished papers relating to travel,  
in Central Asia and elsewhere, in the earlier part of the nineteenth century.

**Central Asia.** **Stein.**

Mountain panoramas from the Pamirs and Kwen Lun. Photographed and  
annotated by Dr. M. Aurel Stein. London: R.G.S., 1908. Size  $13 \times 8\frac{1}{2}$ , pp. x.  
and 36. *Map and Panoramas.* Price (to Fellows), 14s. net; (to non-Fellows),  
20s. net.

**China—Political.** **Hertalet.**

Hertalet's China Treaties. Treaties, etc., between Great Britain and China, and  
between China and Foreign Powers; and Orders in Council, Rules, Regulations,  
Acts of Parliament, Decrees, etc., affecting British interests in China, in force  
on January 1, 1908. 3rd edit. Revised by Godfrey G. P. Hertalet, with the  
assistance of Edward Parkes. 2 vols. London: Wyman & Sons, 1908. Size  
 $9\frac{1}{2} \times 6$ , pp. vi. and 1300. *Maps and Plans.* Price 35s. *Presented by the Foreign  
Office.*

This useful work has been carefully revised and brought up to date. The treaties  
are in three classes: (1) Treaties between Great Britain and China, 1842-1907; (2)  
between other Powers and China, 1869-1907. [The former date appears, both in the  
contents and text, as 1689.] (3) Treaties between European Powers with reference to  
China.

**India.** **Murdoch.**

From Edinburgh to India and Burmah. By W. G. Burn Murdoch. London: G.  
Routledge & Sons, [1908]. Size  $9 \times 6$ , pp. xiv. and 404. *Illustrations.* Price  
10s. 6d. net. *Presented by the Publishers.*

**India.**

The Imperial Gazetteer of India. The Indian Empire. Vol. 2, Historical. New  
edition. Oxford: Clarendon Press, 1908. Size  $9 \times 5\frac{1}{2}$ , pp. xxxvi. and 574. *Map.*  
Price 6s. net. *Presented by the India Office.*

The separate chapters are mostly by experts in the several fields covered. Sir W.  
Hunter's sketch of the History of European settlement has been revised and brought  
up to date.

**India.**

The Imperial Gazetteer of India. New edition. Vols. 5-14. Abasai to Kara.  
Oxford: Clarendon Press, 1908. Size  $8\frac{1}{2} \times 5\frac{1}{2}$ . *Maps.* Price (set of 26 vols.) £5.  
*Presented by the India Office.*

**India—Himalaya.** **Burrard and Hayden.**

A sketch of the geography and geology of the Himalaya mountains and Tibet.  
By Colonel S. G. Burrard and H. H. Hayden. Parts 1-3. Calcutta, 1907. Size  
 $12 \times 9$ , pp. 1-230. *Maps, Profiles, and Illustrations.* *Presented by the India Office.*  
[To be reviewed.]

**India—Historical.****Foster.**

The English factories in India, 1622-1623. A calendar of documents in the India Office and British Museum. By William Foster. Oxford: Clarendon Press, 1908. Size 9 × 6, pp. xl. and 890. *Plan. Price 12s. 6d. net. Presented by the India Office.*

This instalment reproduces all the letters of the years mentioned, preserved at the India Office or British Museum. As in former volumes, Mr. Foster (now Superintendent of Records at the India Office) supplies a lucid and readable introduction, gathering up the leading points in the story.

**India—Nepal.****Lévi.**

Annales du Musée Guimet. Le Nepal: Étude historique d'un royaume hindou. Par Sylvain Lévi. Vol. 3. Paris: E. Leroux, 1908. Size 12 × 6½, pp. 224. *Illustrations. Price 10s.*

This, the concluding, volume deals with inscriptions.

**India—North-West Frontier.**

North-West Frontier Province Gazetteer: Bannu district. Two vols. Peshawar, 1907. Size 10 × 6½, pp. ("A" vol.) vi. and 140; ("B" vol.) c. *Maps. Presented by the India Office.*

**Indo-China—Tonkin.****Diguet.**

Colonel E. Diguet. Les montagnards au Tonkin. Paris: A. Challamel, 1908. Size 10 × 6½, pp. xvi. and 160. *Illustrations. Price 5s. 6d.*

A French officer's account of certain mountain tribes, from personal observations.

**Japan—Volcano Islands.****Wakimizu.**

*Publ. Earthquake Investigation Com. No. 22 C. (1908): pp. 34.*

The Ephemeral Volcanic Island in the Iwōjima Group. By T. Wakimizu. *Maps and Illustrations.*

This island was found in December, 1904. It was already worn nearly to sea-level when inspected by the writer.

**Malay Archipelago.****Baren.**

Physiographische Problemen in den Indischen Archipel. Door J. van Baren. [Leyden], 1908. Size 9½ × 6½, pp. 12. *Presented by the Author.*

**Malay Archipelago.****Verbeek.**

Rapport sur les Moluques: Reconnaissances géologiques dans la partie orientale de l'Archipel des Indes Orientales Néerlandaises. Par R. D. M. Verbeek. Batavia, 1908. Size 10 × 7, pp. xlv. and 844. *Illustrations and Atlas (size 20 × 14). Presented by the Dutch Colonial Office.*

The concluding part of the author's report on his geological reconnaissance in 1899 among the islands between Celebes and New Guinea, including the Timor group.

**Malay Archipelago—Krakatoa.****Ernst.**

*Vierteljahrsschrift Naturforsch. Ges. Zürich 52 (1907): 289-363.*

Die neue Flora der Vulkaninsel Krakatau. Von A. Ernst. *Map and Illustrations.*

**Malay Archipelago—Language.****Brandstetter.**

Malayo-polynesische Forschungen von Prof. Dr. Benward Brandstetter. Zweite Reihe. IV. Mata-Hari, oder, Wanderungen eines indonesischen Sprachforschers durch die drei Reiche der Natur. Lucerne, 1908. Size 9 × 6, pp. 56.

Studies in native nomenclature.

**Persia.****Crasson.**

Persia: the awakening East. By W. P. Crasson. Philadelphia, etc.: J. B. Lippincott Co., 1908. Size 9 × 6, pp. 276. *Illustrations. Presented by the Author.*

**Persia—Lake Urmia.**

*An. G. 17 (1908): 128-144.*

**Mecquenem.**

Le lac d'Ourmiah. Par Roland de Mecquenem.

**Philippines—Ethnology.****Scheerer.**

Zur Ethnologie der Inselkette zwischen Luzon und Formosa. Von Otto Scheerer. *Map and Illustrations.*

**Russia—Siberia—Rivers.****Shostakovich.**

*B.A. Imp. Sc., St. Petersburg (1908): 497-510, 553-570.*

Débacle et congélation des eaux dans la Russie d'Asie. Par V. B. Šostakovič. *Map. [In Russian.]*

**Russia—Siberia—Yeneseisk.** *La G., B.S.G. Paris* 17 (1908): 117-124. **Backlund.**  
Travaux et résultats de l'expédition de la Khatanga (1905). Par Helge Backlund. *Map.*

See note in the May number, p. 564.

**Russian Central Asia.**

**Ficker.**

Zur Meteorologie von West Turkestan. Von Heinz v. Ficker. (From the 'Denkschriften der Math.-Naturwiss. Klasse K. A. Wissenschaften, Wien,' Band lxxi. Wien, 1908.) Size  $12\frac{1}{2} \times 9\frac{1}{2}$ , pp. 36. *Map.*

Noticed in the June number, p. 647.

**Turkey—Palestine.**

**Smith.**

Jerusalem: the topography, economics, and history from the earliest times to A.D. 70. By George Adam Smith. Two vols. London: Hedder & Stoughton, 1907-1908. Size  $9 \times 6$ , pp. (vol. 1) xx. and 498; (vol. 2) xvi. and 632. *Maps, Plans, and Illustrations.* Price 24s. net.

The high reputation of the author leaves little room for doubt that this will take its place as the standard work on the subject.

**Turkey—Railways.** *B.S.R. Belge G. 32* (1908): 5-35.

**Cambier.**

Le réseau ferré de la Turquie d'Asie. Par E. Cambier. *Sketch-map.*

A useful *résumé* of the subject of railway construction in Asiatic Turkey.

# AFRICA.

**Abyssinia—Language.**

**Armbruster.**

Initia Amharica: an introduction to spoken Amharic. By C. H. Armbruster. Part I. Grammar. Cambridge: University Press, 1908. Size  $10 \times 6$ , pp. xxiv. and 398. Price 12s. net. *Presented by the Publishers.*

A work of solid value to students of Amharic, bearing evidence that great care has been bestowed on its preparation. The material has been collected throughout from the mouths of natives.

**British East Africa.**

**Patterson.**

The man-eaters of Tsavo, and other East African adventures. By Lieut.-Colonel J. H. Patterson. London: Macmillan & Co., 1907. Size  $8\frac{1}{2} \times 5\frac{1}{2}$ , pp. xx. and 338. *Map and Illustrations.* Price 7s. 6d. net.

**Central Africa.**

**Johnson.**

Tramps round the Mountains of the Moon and through the back gate of the Congo State. By T. Broadwood Johnson. London: T. Fisher Unwin, 1908. Size  $8 \times 5\frac{1}{2}$ , pp. xxiv. and 316. *Illustrations.* Price 6s. *Presented by the Publisher.*

**Congo State.**

**Goffart.**

Le Congo: géographie, physique, politique, et économique. Par Ferdinand Goffart. 2<sup>e</sup> édit., revue . . . par George Morissens. Brussels: Misch & Thron, 1908. Size  $8\frac{1}{2} \times 5\frac{1}{2}$ , pp. viii. and 502. *Maps.* Price 7 fr. 50. *Presented by the Publishers.*

**German East Africa—Ethnology.**

**Nigmann.**

Die Wahehe: ihre Geschichte, Kult., Rechts-, Kriegs- und Jagd-Gebräuche. Von E. Nigmann. Berlin: E. S. Mittler u. Sohn, 1908. Size  $10 \times 6\frac{1}{2}$ , pp. xii. and 132. *Maps and Illustrations.* Price 3s. 6d.

**Kamerun.**

**Dominik.**

Vom Atlantik zum Tschadsee: Kriegs- und Forschungsfahrten in Kamerun. Von Hans Dominik. Berlin: E. S. Mittler u. Sohn, 1908. Size  $10 \times 6\frac{1}{2}$ , pp. viii. and 308. *Map and Illustrations.* Price 5s. 5d.

**Nigeria, Southern—Ethnology.**

**Parkinson.**

*J.R. Anthropological I.* 37 (1907): 261-267.

A note on the Efik and Ekoi tribes of the eastern province of Southern Nigeria. By John Parkinson. *Illustrations.*

**Nile Basin.**

*Cairo Sci. J.* 2 (1908): 79-94.

**Lyons.**

Some unsolved problems of the Nile Basin. By Captain H. G. Lyons. *Diagram.*

**Sahara.**

**Arnaud and Cortier.**

Mission Arnaud-Cortier. Nos confins Sahariens: étude de géographie militaire.

Par le Capitaine Edouard Arnaud et le Lieut. Maurice Cortier. Paris: E. Larose, 1908. Size  $10 \times 6\frac{1}{2}$ , pp. 512. *Maps and Illustrations*. Price 9s. 6d.

The larger part of the book treats of the military requirements of the French Sahara, from a geographical point of view. The remainder gives a report on the Arnaud-Cortier Mission across the desert (*Journal*, vol. 30, p. 561).

**Sahara.**

Gautier.

Missions au Sahara. Par E.-F. Gautier et R. Chudeau. Tome i.—Sahara Algérien. Par E.-F. Gautier. Paris: A. Colin, 1908. Size  $9\frac{1}{2} \times 6\frac{1}{2}$ , pp. xv., 372. *Maps and Illustrations*. Price 15 fr. Presented by the Publisher. [To be reviewed.]

**Sahara—Adrar.**

*La G., B.S.G.* 17 (1908): 265-280.

Cortier.

L'Adrar des Ifor'ass. Par le lieut. [M. A.] Cortier. *Map*.

**Sahara—Geology.**

*La G., B.S.G.* 17 (1908): 307-309. Chautard and Lemoine.

Sur la constitution géologique de quelques points de la Mauritanie d'après les échantillons rapportés par le capitaine Gerard. Par Jean Chautard et Paul Lemoine. *Sketch-map and Section*.

**Sahara—Geology.**

*La G., B.S.G. Paris* 17 (1908): 111-114.

Freydenberg.

Description géologique de l'itinéraire N'Guigmi-Bilma, d'après les échantillons rapportés par le lieutenant Ajasse. Par le capt. H. Freydenberg. *Map*.

See note in the July number, p. 85.

**Sahara—Tawarek.**

*Tour du monde* 14 (1908): 109-156.

Aymard.

Les Touareg du sud. Par le capt. Am. Aymard. *Sketch-map and Illustrations*.

**South Africa.**

Schultze

Ans Namaland und Kalahari. Bericht an die Kgl. Preuss. Akademie der Wissenschaften zu Berlin über eine Forschungsreise im westlichen und zentralen Südafrika, ausgeführt in den Jahren 1903-1905. Von Dr. Leonhard Schultze. Jena: G. Fischer, 1907. Size  $11 \times 8$ , pp. xiv. and 752. *Map and Illustrations*. Presented by the Publishers.

See Review in the June number, p. 663.

**South Africa—Geodesy.**

Morris and others.

Geodetic Survey of South Africa. Vol. 5. Reports on the Geodetic Survey of the Transvaal and Orange River Colony, executed by Colonel Sir W. G. Morris; and of its connection, by Captain H. W. Gordon, with the Geodetic Survey of Southern Rhodesia. With a preface and introduction by Sir David Gill. London: Harrison & Sons, 1908. Size  $13 \times 8\frac{1}{2}$ , pp. xxxviii. and 464. *Maps, Illustrations, and Diagrams*. Presented by the Agent-General for the Transvaal.

**South Africa—Orography.** *Sitzungsber. K. Preuss. A.W.* (1908): 230-258.

Penck.

Der Drakenberg und der Quathlambabrug. Von Albrecht Penck. *Sections*.

**South Africa—Trade.**

First annual statement of the trade and shipping of the colonies and territories forming the South African Customs Union, 1906. Cape Town, 1907. Size  $13\frac{1}{2} \times 8\frac{1}{2}$ .

**South Africa—Zambesi.** *Scottish G. Mag.* 24 (1908): 193-200.

Trevor-Battye.

Above the Victoria Falls. By Aubyn Trevor-Battye.

**Sudan.**

Freydenberg.

Etude sur le Tchad et le bassin du Chari. Par H. Freydenberg. Paris: F. Schmidt, 1908. Size  $10 \times 6\frac{1}{2}$ , pp. vii. and 192. *Sketch-maps and Illustrations*. Presented by the Publisher.

A careful study of the physical conditions of the Lake Chad area.

**Transvaal—Census.**

Results of a census of the Transvaal Colony and Swaziland, taken on the night of Sunday, April 17, 1904 (pp. lxxxvi. and 756). Supplementary tables in respect of the population of the districts and wards defined by Proclamation No. 42 (Administration), 1904 (pp. viii. and 370). London and Pretoria, 1906. Size  $15\frac{1}{2} \times 13$ . *Maps, Plans, and Diagrams*.

- Tripoli.** *G.Z.* 14 (1908): 129-137. **Banse.**  
Die tripoliner Landschaft. Von Ewald Banse. *Illustrations.*
- Tripoli.** **Martino**  
Giacomo de Martino. Cirene e Cartagine: note e impressioni della carovana de Martino-Baldari; Giugno-Luglio, 1907. Bologna: N. Zanichelli, 1908. Size 10 × 7, pp. xvi. and 198. *Map and Illustrations.* Price 6s.
- West Africa—Boundary.** *Globus* 93 (1908): 229-234. **Reitzenstein.**  
Längs der Ostgrenze von Kamerun. Von Leutnant Freiherr von Reitzenstein. *Illustrations.*  
The author took part in the Franco-German Boundary Commission.
- West Africa—Boundary.** *Deutsches Kolonialblatt* 19 (1908): 424-428. ———  
Das deutsch-französische Grenzabkommen, betreffend Kamerun und den Congo français, vom 18. April 1908. *Map.*  
See note and map in the July number, pp. 87-88.
- West Africa—Coast.** *An. G.* 17 (1908): 97-104. **Hubert.**  
La "barre" au Dahomey. Par Henry Hubert. *Diagram and Illustrations.*  
See note in the August number, p. 185.
- West-Central Africa.** **Johnston.**  
George Grenfell and the Congo. A history and description of the Congo Independent State and adjoining districts of Congoland, together with some account of the native peoples and their languages, the fauna and flora; and similar notes on the Cameroons and the island of Fernando Pô, the whole founded on the diaries and researches of the late Rev. George Grenfell; on the records of the Baptist Missionary Society; and on additional information contributed by the author, by the Rev. Lawson Forfeitt, Mr. Emil Torday, and others. By Sir Harry Johnston. Two vols. London: Hutchinson & Co., 1908. Size 9½ × 6½, pp. xxiv., xx., and 990. *Maps and Illustrations.* Price 30s. net. Presented by the Author. [To be reviewed.]

## NORTH AMERICA.

- Bermudas—Bibliography.** **Cole.**  
Bermuda in periodical literature, with occasional references to other works. A bibliography, by George Watson Cole. (Brookline, Mass.: privately printed), 1907. Size 9½ × 6, pp. xii. and 276. *Portrait and Facsimile titles.* Presented by the Author.  
This seems to give a very complete list of the scientific papers which have appeared on the subject of Bermuda, while it includes also papers of a more popular character. It is not quite easy to recognize the system which has governed the inclusion of entries from non-periodical literature.
- British North America—Labrador.** **Wallace.**  
The long Labrador trail. By Dillon Wallace. London: Hodder & Stoughton, (1907). Size 8½ × 5½, pp. xii. and 316. *Maps and illustrations.* Price 7s. 6d.
- Mexico—Historical.** **MacNutt.**  
Letters of Cortes: the five letters of relation from Fernando Cortes to the Emperor Charles V. Translated and edited . . . by Francis Augustus MacNutt. 2 vols. New York and London: G. P. Putnam's Sons, 1908. Size 9½ × 6. pp. (vol. 1) xii. and 354; (vol. 2) vi. and 374. *Portraits and facsimile Maps and Plans.* Price 42s. net. Presented by the Publishers.
- Mexico—Geological History.** **Hill.**  
Growth and decay of the Mexican plateau. By Robert T. Hill. (From the *Engineering and Mining Journal*, vol. 85, 1908.) Size 12 × 9, pp. 8. *Map and Illustrations.*  
Another paper by Mr. Hill on the Mexican plateau was referred to in vol. 30, p. 93.
- Mexico—Sierra Madre.** *Z. Ges. E. Berlin* (1908): 147-167. **Prenss.**  
Reise zu den Stämmen der westlichen Sierra Madre in Mexiko. Von Dr. K. Th. Prenss. *Illustrations.*
- United States.** ———  
Report of the Superintendent of the Coast and Geodetic Survey, showing the

progress of the work from July 1, 1906, to June 30, 1907. Washington, 1907. Size  $11\frac{1}{2} \times 9$ , pp. 566. *Maps, Illustrations, and Diagrams.*

One of the appendices treats of earth-movements in the California earthquake of 1906.

**United States—California.**

Barrett and Kroeber.

The ethnogeography of the Pomo and neighbouring Indians. By S. A. Barrett. The geography and dialects of the Miwok Indians. By the same. On the evidences of the occupation of certain regions by the Miwok Indians. By A. L. Kroeber. (*University of California Publications in American Archeology and Ethnology*, vol. 6, Nos. 1-3.) Berkeley, Cal., 1908. Size  $11 \times 7$ , pp. 1-380. *Maps. Presented by the University of California.*

**United States—California.** *Sierra Club B. 6* (1908): 211-220.

Muir.

The Hetch-Hetchy Valley. By John Muir. *Illustrations.*

In describing this part of the Yosemite park, the writer protests against the scheme for damming the valley for water-supply purposes.

**United States—Commerce.** *B. American G.S. 40* (1908): 129-143.

Johnson.

Geographic influences affecting the early development of American commerce. By Emory R. Johnson.

**United States—Ice Age.** *American J. Sc. 25* (1908): 217-226.

Carney.

A possible overflow channel of ponded waters antedating the recession of Wisconsin ice. By Frank Carney. *Map and Illustration.*

**United States—New Jersey.** *Pr. A. Nat. Sc., Philadelphia 59* (1907): 452-459.

Stone.

The life-areas of southern New Jersey. By Witmer Stone.

**United States—New Jersey.** *J.G. 6* (1908): 177-182.

Whitbeck.

Geographical influences in the development of New Jersey. By R. H. Whitbeck.

See note in the June number, p. 678.

**United States—Ohio.** *American J. Sc. 25* (1908): 239-243.

Hubbard.

Ancient finger lakes in Ohio. By Geo. D. Hubbard. *Sketch-maps.*

**United States—Sierra Nevada.** *Sierra Club B. 6* (1908): 225-234.

Gilbert.

Lake Ramparts. By G. K. Gilbert. *Illustrations.*

Discusses the origin of the lines of boulders fringing the shores of many Sierra lakes (see August number, p. 190).

**United States—Swamps.** *National G. Mag. 19* (1908): 190-199.

Chapman.

A drowned empire. By Robert T. Chapman. *Illustrations.*

Describes various swamp lands of the United States in connection with a movement lately set on foot for their reclamation.

**United States—Washington.**

A review of the resources and industries of Washington, 1907. Published . . . by the Bureau of Statistics, etc. Olympia, Washington, 1907. Size  $9 \times 5\frac{1}{2}$ , pp. 238 and 56. *Map and Illustrations.*

**United States—Waterways.** *Popular Sc. Monthly 72* (1908): 289-303.

McGee.

Our inland waterways. By Dr. W J McGee.

Discusses the recent movement for the improvement of internal navigation. (See July number, p. 89.)

# PHYSICAL AND BIOLOGICAL GEOGRAPHY.

**Geophysics.**

*P. American Philos. S. 46* (1907): 369-416.

See.

The new theory of earthquakes and mountain formation, as illustrated by processes now at work in the depths of the sea. By T. J. J. See. Size  $9\frac{1}{2} \times 6\frac{1}{2}$ . *Maps and Diagrams. Also separate copy, presented by the Author.*

**Glacial Deposits.**

*Z. Ges. E. Berlin* 1908: 187-191.

Werth.

Zur Unterscheidung und Benennung eiszeitlicher Ablagerungen. Von Dr. Emil Werth.

**Glaciers—Structure.**

*Z. Gletscherkunde 2* (1908): 198-212.

Crammer.

Zur Entstehung der Blätterstruktur der Gletscher aus der Firnschichtung. Von Hans Crammer. *Illustrations.*

- Limnology.** *Popular Sc. Monthly* 72 (1908): 337-351. **Birge.**  
 The respiration of an inland lake. By Prof. E. A. Birge. *Diagram*.  
 Under the term "respiration" the author includes the exchange of gases between the air and the water, and that between the water and the included organisms. (See *Monthly Record*, August, p. 190.)
- Limnology.**  
 Instructions for the study of lakes. Compiled by the members of the Permanent Commission for the study of the Russian lakes. St. Petersburg, 1908. Size 10 x 6½, pp. 298. *Illustrations*. [In Russian.] *Presented by the Imperial Russian Geographical Society*.
- Meteorology—Evaporation.** **Bigelow.**  
*U.S. Monthly Weather Rev.* 35 (1907): 311-316; 36 (1908): 24-39.  
 Studies on the phenomena of the evaporation of water over lakes and reservoirs. By Prof. Frank H. Bigelow. Parts I.-III. *Illustrations and Diagrams*.
- Meteorology—Pressure.** *Meteorol. Z.* 25 (1908): 103-108. **Trabert.**  
 Die Luftdruckverhältnisse in der Niederung und ihr Zusammenhang mit der Verteilung der Temperatur. Von W. Trabert.
- Natural Regions.** *G.Z.* 14 (1908): 1-13, 94-110, 137-150. **Hettner.**  
 Die geographische Einteilung der Erdoberfläche. Von Alfred Hettner.
- Oceanography—Deposits.** **Van't Hoff and others.**  
*Sitzb. K. Preuss. A.W.* 1897-1908, *passim*.  
 Untersuchungen über die Bildung der ozeanischen Salzablagerungen, I.-LII. Von J. H. van't Hoff u.s. *Diagrams*.
- Oceanography—Troughs.** *Globus* 93 (1908): 60-63. **Arlt.**  
 Die geographische Lage der abyssischen Gräben. Von Dr. Th. Arlt.
- Sea-level.** *M. k.k. G. Ges. Wien* 51 (1908): 1-56. **Gairs.**  
 Beobachtungen über den Fortschritt einer säkularen Niveauschwankung des Meeres während der letzten zwei Jahrtausende. Von Dr. Anton Gairs.  
 See note in the *Monthly Record*, July, p. 91.
- Seismology.** **Costanzi.**  
 Contributo alla interpretazione elastica dei fenomeni sismici e bradisismici. Del Tenente Giulio Costanzi. Pavia, 1908. Size 9½ x 6½, pp. 92. *Diagrams*. *Presented by the Author*.
- Seismology.** *P.R.S. Edinburgh* 38 (1908): 217-230. **Knott**  
 Seismic radiations. By Prof. C. G. Knott.
- Seismology.** *Nature* 77 (1908): 592-597. **Milne.**  
 Recent Earthquakes. By Prof. J. Milne. *Sketch-maps*.
- Snow-forms.** *Z. Gletscherkunde* 2 (1908): 296-303. **Spethmann and Brückner.**  
 Schneeschmelzkegel auf Island. Von Hans Spethmann. *Diagram and Illustr.*  
 Schneeschmelzkegel in den Alpen und Nieve Penitente. Von Ed. Brückner. *Illustration*.  
 See note, *ante*, p. 312.
- Terrestrial Magnetism.** *Meteorol. Z.* 25 (1908): 97-103. **Nippoldt**  
 Bemerkungen zu neuen Karten des Feldes der täglichen Variation des Erdmagnetismus. Von A. Nippoldt. *Maps*.
- Tides.** **Harris.**  
 Manual of tides. Part V. Currents, shallow-water tides, meteorological tides, and miscellaneous matters. By Rollin A. Harris. (Reprint of Appendix 6 to the Report of the U.S. Coast and Geodetic Survey for 1907.) Washington, 1908. Size 11½ x 9, pp. 231-546. *Maps and Diagrams*.
- Tides.** **Ruthven.**  
 Theory of the tides. By J. F. Ruthven. Adelaide, 1907. Size 10 x 6, pp. 12. *Diagrams*.
- Zoogeography—Fishes.** **Reichard.**  
 Die deutschen Versuche mit gezeichneten Schollen. II. Bericht. Von Adolf C. Reichard. Oldenburg i. Gr., 1908. Size 13 x 10½, pp. 58. *Maps*.  
 On experiments with a view to throwing light on the migrations, etc., of the plaice.

## NEW MAPS.

By E. A. REEVES, *Map Curator, R.G.S.*

## EUROPE.

## Austria.

Peucker.

Generalkarte von Bosnien und der Herzegowina nebst Dalmatien. Bearbeitet von Dr. Karl Peucker. Scale 1: 864,000 or 1 inch to 13·6 stat. miles. Vienna: Artaria & Co., 1908. Price 3 kr. Presented by the Publisher.

## British Islands—Channel Islands.

Bartholomew and Piquet.

New survey map of Jersey after the map of R. C. Carrington, F.R.A.S., and latest authorities by J. C. Bartholomew, F.R.G.S., and edited by George A. Piquet. Scale 1: 21,700 or 2·9 inches to 1 stat. mile. St. Heliers: C. P. Du Parc, [1908].

A boldly drawn coloured map of the island. Round the coast-line the low-water mark and two and three fathom lines are shown. Numerous heights of land are shown in figures, a special feature being the indication of the heights of rocks off the coast above low water.

## British Islands—England and Wales.

Ordnance Survey.

Sheets published by the Director-General of the Ordnance Survey, Southampton, from July 1 to 31, 1908.

1-inch (third edition):—

In outline, 112, 116, 127, 201, 311. 1s. each (engraved).

With hills in brown or black, 99, 347. 1s. each (engraved).

Large-sheet series, printed in colours, folded in cover or flat in sheets, 51, 61, 62, 84. Price, on paper, 1s. 6d.; mounted on linen, 2s.; mounted in sections, 2s. 6d. each.

6-inch—County Maps:—

Cornwall (First Revision), 57 S.E., (61a S.E. and 67 N.E.), 62 S.W., 67 N.W., (67 N.E. and 61a S.E.), 68 N.W., N.E., (72 S.W. and S.E.), 76 N.E., S.E., 77 N.E., 80 N.W., 81 N.W., 85 (N.W. and S.W.), N.E. Kent (Second Revision), 22 N.E., N.W., 24 S.W., 33 S.E., 34 S.W., 44 N.E., 46 N.E., 64 S.W., 65 N.E., S.W., 66 N.W., S.W., 71 N.E., 72 N.W., N.E., 73 N.W., S.W., 74 N.E., 75 (N.E. and S.E.), 81 N.W. Lancashire (First Revision of 1891 Survey), 116 N.W. Lincolnshire (First Revision), 7 S.E. Pembrokeshire (First Revision), 5 N.W., 14 (N.W. and N.E.), 20 N.E., 27 N.E., S.E. Yorkshire (First Revision of 1891 Survey), 221 N.W., 230 S.W., 233 S.E., 237 S.W. 1s. each.

25-inch—County Maps:—

Hampshire (Second Revision), XC. 3; XCI. 15; XCIII. 7, 10; XCIV. 1, 4, 6, 8; XCV. 3, 5, 6, 8, 9, 10, 11; XCVII. 2, 4; XCVIII. 1, 11; C. (6 and 5). Kent (Second Revision), IV. 13, 15, 16; XI. 1, 4; XII. 1; XX. 15; XXXII. 15, 16; XLII. 15; XLIII. 2, 3, 4, 6, 8, 11, 12, 13, 15, 16; XLIV. 1, 9, 18; LII. 2, 3, 4, 15, 16; LIII. 1, 2, 4, 13; LIV. 1; LXII. 2, 3, 4, 6, 7, 8, 10, 11, 12, 15, 16; LXX. 2, 3, 4, 10; LXXVIII. 2, 8; LXXIX. 9. Lancashire (First Revision of 1891 Survey), XCI. 6, 10, 12, 14; XCH. 5, 6, 7, 11, 12, 13; XCIX. 4; C. 1, 5; CI. 2, 4, 6, 7, 8, 9, 10, 14; CIV. 9; CVI. 4. Pembrokeshire (First Revision), XXXVIII. 1, 2, 4, 5 (6 and 10), 8 (10 and 6); XXXIX. 1, 9, 10, 11, 12; XL. 6. 3s. each. Yorkshire (First Revision of 1891 Survey), CLXXXI. 7; CCIII. 2, 3, 6, 7, 8, 10, 12, 15, 16; CCIV. 1, 2, 3, 4, 5, 18; CCXVII. 1, 2, 3, 4, 8, 16; CCXVIII. 1, 2, 3, 4, 5, 9, 10, 15, 16. 3s. each. CCXVIII. 5, 6. 1s. 6d. each.

(E. Stanford, London Agent.)

## British Islands—England and Wales.

Geological Survey.

1-inch Map—New Series, printed in colours. Drift edition, sheet 54: Scarborough, Filey, Hunmanby, etc. Price 1s. 6d.

6-inch maps—Uncoloured.

Brecknockshire, 46, S.W., 47 N.W., N.E., 51 N.W. Glamorgan, 6 S.W., S.E., 12 N.W., N.E., S.W., S.E., 13 N.W., S.W., 19 N.W., N.E., S.W., S.E., 23 N.W., N.E., S.W., S.E., 29 S.E.,

42 N.W. Monmouthshire, 10 S.E., 11 N.W., N.E., S.W., S.E., 16 N.E., 17 N.W., N.E., S.W., S.E., 18 S.W., 27 S.E., 28 S.W. 1s. 6d. each.

(E. Stanford, London Agent.)

#### Europe.

Bjørnbo and Petersen.

*Anecdota Cartographica Septentrionalia. Ediderunt Axel Authon Bjørnbo et Carl S. Petersen. Hauniæ: Sumptibus Societatis Regiæ Scientiarum Danicæ, 1908. Presented by the Royal Danish Society of Sciences.*

This portfolio contains photographic facsimiles of eleven maps of northern Europe drawn between the fourteenth and seventeenth centuries, accompanied by explanatory text and lists of names. No attempt has been made to give a systematic cartographical survey of the region included, but, according to the editor's introduction, the work must be considered purely as a collection of material—a chronologically arranged series of cartographical sources for the period covered.

The process of reproduction has received serious attention, and every effort has been made to secure a clear and truthful copy of the original, with as little touching up as possible. In places where there was no doubt as to the original, but where the photograph, on account of impurities in the material, shades of colour, etc., failed to secure the purpose, the proofs were cautiously corrected in accordance with the original, and occasionally, in order to obtain greater distinctness, a tint of colour has been added to the water or the land. Due acknowledgment is made to M. Dahlgren of Stockholm, Prof. Palmén of Helsingfors, Hofrat v. Wieser of Innsbruck, Dr. W. Ruge of Leipzig, Prof. Usielli of Florence, and others for advice and assistance given. The editors and the Royal Danish Society of Sciences have rendered valuable service to all interested in the early cartography of Europe by the publication of these interesting facsimiles. The following is a list of the maps included, with the libraries where the originals are deposited:—1, Anonymous Catalanian Sea-Chart, fourteenth century [section]. (Biblioteca Nazionale, Museo Borbonico, Napoli). 2, Henricus Martellus Germanus: Map of the North, ca. 1490 (Universitätsbibliothek, Leiden). 3, Henricus Martellus Germanus: Map of Scandinavia, ca. 1490 (British Museum, London). 4, Anonymous Chart of the Atlantic Ocean, ca. 1504 [section] (Kgl. Bayerische Armee-Bibliothek, München). 5, Cornelis Anthonisz.: Map of Denmark and Adjacent Countries, ca. 1550-1565 (Ehemal. Universitätsbibliothek, Helmstedt). 6, Marcus Jorden: Map of Schleswig and Holstein, 1559 (Universitätsbibliothek, Leiden). 7, Anonymous Map of the Inner Baltic, 1550-1600 (Universitätsbibliothek, Leiden). 8, Anonymous Map of North Fjord, 1594 (K. K. Hofbibliothek, Wien). 9, Anonymous sketch of a map of the Southern part of the West Coast of Norway, 1586-1600 (K. K. Hofbibliothek, Wien). 10, Simon van Salinghen: Map of the Northernmost Parts of Europe, 1601 (Riksarkivet, Stockholm). 11, Joris Carolus: Map of Iceland, Greenland, and the Northern Part of America, 1626 (Algemeene Rijksarchief, 's Gravenhage).

#### France.

Ministre de l'Intérieur, Paris.

Carte de la France dressée par ordre du Ministre de l'Intérieur. Scale 1: 100,000 or 1 inch to 1·6 stat. mile. Sheets: iv.-17, Quimper; v.-16, Gourin; ix.-10, Cherbourg; xiv.-21, Châtillon-sur-Indre; xv.-13, Mantes; xvi.-21, Issoudun; xviii.-9, St. Quentin; xix.-31, Florac; xx.-30, Largentière; xxv.-33, Castellane; xxvi.-34, Nice; xxx.-40, Boccagnano; xxx.-41, Zicavo. Paris: Ministère de l'Intérieur, Service Vicinal, 1908. Price 0·80 fr. each sheet.

These are new editions.

#### ASIA.

K. Preuss. Landesaufnahme.

#### China.

Karte von Tschili und Schantung. Bearbeitet in der kartogr. Abteilung der Kgl. Preuss. Landesaufnahme. Scale 1: 200,000 or 1 inch to 3·2 stat. miles. Sheets: C 11, Tang hsien; C 12, Dscheng ding fu; D 9, Hsüan 'hua fu; D 11, Báu ding fu; D 12, Schen dschón; D 13, Dai dschón; E 9, Tschang ping dschón; E 10, Peking; E 11, Yung tsing hsien; E 12, Ho dsien fu; E 13, De dschón; F 9, Deun 'hua dschón; F 10, Báu di hsien; F 11, Tiéntsin; F 12, Yen schan hsien; F 13, Wu ding fu; G 9, Daien tschang ping; G 10, Yung ping fu; G 11, Li ba áu; G 13, Li dsing hsien; H 9, Schan 'hai guan; H 10, Tain wang dsán. Berlin: K. Preuss. Landesaufnahme, 1907. Price 2m. each sheet.

Twenty-two sheets of the new large-scale map of the provinces of Chih-li and Shantung, now in course of publication by the German Government, and based upon

the most reliable surveys and sketches up to date. It is printed in colours, and in the case of important places, the names are repeated in Chinese characters. The present sheets include Peking and the surrounding country, extending as far south as the northern frontier of Shantung.

#### Philippine Islands.

Hodgson.

Map of the Philippine Islands, compiled from original sources by Caspar W. Hodgson. Scale 1: 1,115,000 or 1 inch to 17.6 stat. miles. New York: World Book Company, 1908.

From the list of authorities consulted in the preparation of this map, it would appear that no pains have been spared to render it as complete and up to date as possible. It is a good general map, clearly printed in colours, and measures  $4\frac{1}{2}$  feet by  $3\frac{1}{2}$  feet.

### AFRICA.

#### Africa.

Passage.

Gliederung Afrikas nach physikalischen und wirtschaftlichen Gesichtspunkten. Von Siegfried Passage. Scale 1: 60,000,000 or 1 inch to 947 stat. miles. *Petermanns Mitteilungen*, Jahrgang, 1908, Tafel 13. Gotha: Justus Perthes, 1908. *Presented by the Publisher.*

#### Algeria.

Jonnart.

Carte de l'Algérie. Dressée par ordre de M. Jonnart, Gouverneur Général de l'Algérie, au Service des Cartes et Plans du Gouvernement Général de l'Algérie. Scale 1: 200,000 or 1 inch to 3.2 stat. miles. Sheets: 4, Alger; 5, Djurjura. Algiers: Service des Cartes et Plans du Gouvernement Général de l'Algérie. [1908.] *Price 1 fr. each sheet. Presented by M. R. de Flotte Roquecaire, Chef du Service des Cartes et Plans du Gouvernement Général de l'Algérie.*

Two sheets of a good general map of Algeria, printed in colours. They include Alger and the country to the east for about 100 miles. Railways and roads up to date are clearly shown.

#### Egypt.

Survey Department, Cairo.

Topographical map of Egypt. Scale 1: 50,000 or 1.6 inch to 1 stat. mile. Sheets: s.w. III.-I., Senures; III.-II., Birket Qarun; IV.-I., Medinet el Fayum; IV.-II., El Nasla; V.-I., Ahnasia; V.-II., El Gharag el Sultan. Cairo: Survey Department, 1908. *Presented by the Director-General, Survey Department, Cairo.*

#### Gold Coast.

Guggisberg.

Map of the Gold Coast. Published by the authority of Sir John Pickersgill Rodger, K.C.M.G., Governor, under the direction of Major F. G. Guggisberg, R.E., F.R.G.S., Director of Surveys, Gold Coast. Scale 1: 125,000 or 1 inch to 1.9 stat. mile. Sheets: 72-J-IV., Wiawoso; 72-K-III., Obuasi (2nd edit.); 72-P-III. and 72-V-I., Tanoso and Beyin; 72-P-IV., Prestia; 73-G-IV., Dsoje. Edinburgh and London: W. & A. K. Johnston, Ltd., 1908. *Price 2s. each sheet. Presented by Major F. G. Guggisberg, R.E., Director of Surveys, Gold Coast.*

### AMERICA.

#### Brazil.

Freire.

Republica dos Estados Unidos do Brasil. Mappa organizado e desenhado por Olavo Freire. Scale 1: 4,000,000 or 1 inch to 63.1 stat. miles. Rio de Janeiro: Francisco Alves & Cia., [1908].

A somewhat sketchy and decidedly overcoloured map of Brazil, useful specially for the enlarged inset plans it contains. These are of Recife, S. Paulo, S. Salvador, Bello Horizonte, Belem, and of the commercial centre of Rio de Janeiro.

#### Canada.

Department of the Interior, Ottawa.

Standard Topographical Map of Canada. Scale 1: 500,000 or 1 inch to 7.8 stat. miles. Sheet 29, Lake Nipigon. Ottawa: Department of the Interior, 1907. *Presented by the Department of the Interior, Ottawa.*

#### Canada—British Columbia.

Boyd.

Special map of Rossland, British Columbia. By W. H. Boyd. Scale 1: 4800 or 13.2 inches to 1 stat. mile. Ottawa: Department of Mines, Geological Survey Branch, 1908. *Presented by the Geological Survey of Canada.*

## GENERAL.

## World.

Johnston.

Johnston's Royal Atlas of Modern Geography, exhibiting, in a series of sixty entirely original and authentic maps, the present condition of geographical discovery and research in the several Countries, Empires, and States of the World. Edinburgh and London: W. & A. K. Johnston, Ltd., 1908. *Price* £4 4s. *net*. *Presented by the Publishers.*

In this new edition of the Royal Atlas three entirely new maps have been added, viz. the South Polar Regions, a political map of the British Isles, and a map of Japan. The map of the Mediterranean has been extended to the west so as to include the whole of the Atlantic coast of Spain and Portugal. These additions make the atlas more complete, and the execution of the new maps is very creditable, with the exception of the colouring, which in the case of the polar maps is somewhat heavy and overdone. Generally speaking, the work of revision has been carefully attended to, so far as is possible without entirely redrawing the maps, which in some cases is now almost necessary in order to render the physical features satisfactory. At the end of the atlas a useful "General Index to the Principal Places of the World" is given for the first time, consisting of an alphabetical list of places with their latitudes and longitudes.

## World.

St. Martin and Schrader.

Atlas Universel de Géographie, construit d'après les sources originales et les documents les plus récents, cartes, voyages, mémoires, travaux géodésiques, etc., avec un texte analytique. Ouvrage commencé par M. Vivien de Saint Martin et continué par Fr. Schrader. Sheet No. 76. États-Unis d'Amérique (Sud-Est). Paris: Hachette et Cie., 1908. *Presented by the Publisher.*

In the compilation of this sheet, the recent United States government survey appear to have been utilized, including those of the Geological Survey, and the Coast and Geodetic Survey. Thirteen sheets out of a total of ninety now remain to be published in order to complete the atlas.

## World.

Schrader and Gallouédec.

Atlas Clásicode Geografía Moderna. Por F. Schrader y L. Gallouédec. Trazado especialmente para los Institutos y Colegios de los Estados de la América Latina. Paris: Hachette et Cie., [1908]. *Price* 7.50 fr.

A useful little atlas specially prepared for the educational establishments of South American countries. In general appearance the maps resemble those in Schrader's 'Atlas de Géographie Moderne,' and consist of a well-selected series of coloured physical and political maps of all parts of the world, special attention being given to South America. There are many insets on small scales, and by means of numerous diagrams, sections, and text surrounding the maps, much useful information is given.

## CHARTS.

## Admiralty Charts.

Hydrographic Department, Admiralty.

Charts and Plans published by the Hydrographic Department, Admiralty, during June, 1908. *Presented by the Hydrographer, Admiralty.*

## New Charts.

No.	Inches.	
3668 m = 1·0		Gulf of Bothnia:—Approaches to Marichamn, Degerö, and Bomarsund. 4s.
3688 m = 0·9		Ports on the west coast of Florida:—Approaches to Port Inglis, Charlotte harbour. 3s.
819 m = $\left\{ \begin{smallmatrix} 2·9 \\ 7·9 \end{smallmatrix} \right\}$		Ceylon:—Approaches to Galle harbour, Galle harbour. 3s.
1236 m = 3·3		China, north coast:—Approaches to Ryojun ko ( <i>Port Arthur</i> ). 2s.

## New Plans and Plans added.

801 m = 4·7	San Domingo, approaches to Port au Prince. New Plan:—Jeremie bay. 3s.
2395 m = 1·0	Ports in the Philippine islands. New Plan:—Port Palapag and Laoang ( <i>Laguan</i> ) bay. 2s.

## Charts Cancelled.

No.

- |  |  |
|--|--|
| 819 Ceylon:—Approaches to Point de Galle harbour, including the Gindura and Bellows rocks. | } New chart.<br>Approaches to Galle harbour: Galle harbour 819 |
| 820 Ceylon:—Point de Galle harbour.  |  |
| 1236 China north coast:—Approaches to Port Arthur or Lu shun kau.                          | } New chart.<br>Approaches to Ryojun ko (Port Arthur) 1236     |
|  |  |

## Charts that have received Important Corrections.

No. 2554, Italy, Leghorn roadstead:—Port of Leghorn. 1749, South America, east coast:—Monte Video to Buenos Aires. 2544, South America, east coast—Rio de la Plata. 22, Persian gulf:—Kuweit harbour and approaches. 1419, Andaman islands:—Long island to Port Blair. 1459, China, south coast:—Hong Kong harbour. 3280, China, south coast:—Hong Kong waters, east. 8279, China, south coast:—Hong Kong waters, west. 873, Japan:—Amami group. 457, Japan:—Aburatani harbour and approaches. 2185, New Zealand:—Nelson Anchorages. 2658, Solomon Islands:—Gavutu and Tulagi harbours.

## Indian Ocean and Red Sea.

## Meteorological Office.

Monthly meteorological charts of the Indian Ocean north of 15° S. lat. and Red Sea, August, 1908. London: Meteorological Office, 1908. Price 6d. each. Presented by the Meteorological Office.

## North Atlantic and Mediterranean.

## Meteorological Office.

Monthly meteorological charts of the North Atlantic and Mediterranean, August, 1908. London: Meteorological Office, 1908. Price 6d. each. Presented by the Meteorological Office.

## North Atlantic.

## U.S. Hydrographic Office.

Pilot chart of the North Atlantic Ocean, July, 1908. Washington: U.S. Hydrographic Office, 1908. Presented by the U.S. Hydrographic Office.

## North Pacific.

## U.S. Hydrographic Office.

Pilot chart of the North Pacific Ocean, August, 1908. Washington: U.S. Hydrographic Office, 1908. Presented by the U.S. Hydrographic Office.

## PHOTOGRAPHS.

## China.

## Davies and Hilton-Johnson.

One hundred and twenty-six photographs of the Chih-li Province, China, taken by Major H. R. Davies, 52nd Oxfordshire Light Infantry, and Captain A. H. Hilton-Johnson, Lincolnshire Regiment, 1907. Presented by Major H. R. Davies.

An interesting and characteristic set of photographs mounted in an album, made specially valuable by the care Major Davies has taken to classify and describe them. Amongst them are some good panoramic views of scenery.

(1, 2, and 4-6) Typical scenery on the road between Peking and Shan-hai-kuan; (3) The Lan Ho near Yung-p'ing Fu; (7 and 8) Salt marshes near Pei-t'ang; (9) On the road between Peking and Shan-hai-kuan; (10 and 13) Tower on Peking-Shan-hai-kuan road; (11) Stream, Peking—Shan-hai-kuan road; (12) A hollow road; (14) Buddhist nun's tomb near T'ung Chou; (15-19 and 26-31) Typical villages on the Chih-li plain; (20) The Tou Ho, on the Peking—Shan-hai-kuan road; (21) Village on the Pei-t'ang Ho; (22) Village on Lu-t'ai canal; (23) Eastern suburb of Fêng-jun Hsien; (24) Salt heaps at Han-ku on the Pei-t'ang Ho; (25) On the Pei Ho; (32) Blacksmith's shop; (33) Type of big house in village; (34) A wayside tea-house; (35 and 37) House in a village; (36) Fishermen's huts near Ch'in-wang-tao; (38 and 40) Inn yard; (39) A midday halt; (41-49) Temples on the Chih-li plain; (50-56 and 60-63) Typical villagers of Chih-li plain, in summer clothes; (57) A blind beggar; (58) Reservists of 2nd Division going up for training; (59) Boatman on the Pei-t'ang Ho; (64) A crop of Kao-liang (high millet); (65) Ploughing; (66) A crop of Hsiao-mi (small millet); (67) Loading; (68 and 69) Carrying; (70) Pulling heads off millet for threshing; (71) Threshing; (72-78) Animals; (79 and 81) Peking carts; (80 and 82) Big carts; (83) Four-horsed cart; (84) Two-man wheelbarrow; (85-88) Po-ch'uan

or cargo boats, on the Pei Ho and Ta-ch'ing Ho; (89-91) K'ua-tsu, or passenger boats, on the Pei Ho and Ta-ch'ing Ho; (92) Big sea-going junk at Pei-t'ang; (93) House-boat on Pei-t'ang Ho; (94) Sea-going fishing junks at Pei-t'ang; (95) Cargo boats on Pei-t'ang Ho; (96) Ts'ao-tzu (snake boat) on Pei-t'ang Ho; (97) Erh ts'ao-tzu (double snake boat) on Pei-t'ang Ho; (98 and 101) Salt boats on Lan Ho; (99 and 100) Ferry boats for carts; (102) Ferry over the San Ho near San-ho Hsien; (103) Ferry over Pei Ho at Tung Chou; (104) Railway bridge over Pei-t'ang canal; (105) Wooden bridge over Lu-t'ai canal near Tientsin; (106 and 107) Bridges over the Ta-ch'ing Ho; (108) Stone bridge; (109) Lock at Lu-t'ai; (110) Wooden bridge near Tientsin; (111) Shan-hai-kuan city wall; (112) An Chou city wall; (113) Lan Chou city wall; (114) Guard house on Shan-hai-kuan city wall; (115) Peking, interior of Chinese city from Chang-yi Mên; (116) Peking, main street of Chinese city, looking south from Ch'ien Mên; (117) Peking, the Ch'ien Mên (gate between Chinese and Tartar cities); (118 and 119) Peking, interior of Tartar city from south wall; (120) Peking, south wall of Chinese city, looking west from the Yung-ting Mên; (191) Ch'in-wang-tao harbour; (122) Ch'in-wang-tao bluff from the pier; (123) View north from the sand-hills at north end of Ch'in-wang-tao bluff; (124) Sandhills at north end of Ch'in-wang-tao bluff; (125) View from hotel at Shan-hai-kuan; (126) View from outside the west suburb of Shan-hai-kuan.

#### China.

Kirkhope.

Sixty-five photographs of China, taken by Hugh Kirkhope, Esq., M.A. Presented by Hugh Kirkhope, Esq., M.A.

The first five are large views of the Ellis Kadoobie schools at Canton; the greater number of the remainder being views of Canton and its environs, Chifu, Wei-hai-wei, and Peking. They are placed in an album and carefully described. The titles are as follows:—

School at Sai-kuan (Canton):—(1) Entrance; (2) Beginners' class; (3) A reading lesson under an Anglo-Chinese master; (4) Group of pupils and master; (5) Group of masters and local secretary of the school. (6) Bridge opposite Shamien, Canton; (7) Gate, Canton; (8) A market-place, Canton; (9) Lo Pan Miu, Honan; (10) A courtyard; (11) One of the older streets, Canton; (12) Old dome-shaped roofs, outskirts of Canton; (13) House decorated for marriage; (14) On the way to Kun-yam Shan; (15) Street scene, Canton; (16 and 17) Dwellings on the creek; (18 and 19) The nine-storey pagoda, Canton; (20 and 21) Paddy-fields; (22 and 23) Beggars; (24) Hill tombs; (25) Terrace on river-side, Honan; (26) Old walled market town, at foot of White Cloud hills; (27) Temple on White Cloud hills; (28) Hill graves; (29) Entrance to old temple, Canton; (30) Roof of temple; (31) General view of temple; (32) A hill road in rain; (33) Scene from Pak-wen-Shan; (34) Temple steps; (35) Interior view of temple; (36) Temple gates; (37) Bridge near Ten Table island, Macao; (38) Temple on Kun-yam Shan; (39) Temple at Pun-tong; (40) A scene in Honan; (41) Very old temple gates, Canton; (42) Entrance to "City of the Dead," Canton; (43) Archery practice; (44) Irrigation in Fa-ti; (45) Temple buildings on Pak-wen Shan; (46) Looking towards Kun-yam Shan; (47) The Viceroy's chair, Canton; (48) Outer courtyard of house; (49) A Chinese scholar; (50) Street scene, Chifu; (51) Street theatrical performance, Wei-hai-wei; (52) Scene on the beach, Wei-hai-wei; (53) Small Hill-Joss, Wei-hai-wei; (54) Hatamên gate, Peking; (55-57) Hatamên Street, Peking; (58) Gate on north side of Peking; (59) View near Legation quarter, Peking; (60) One of the watch towers on the walls, Peking; (61) Funeral procession, Peking; (62) Imperial chair and retinue conveying Emperor's presents to Prince Fushimi; (63) Official's chair; (64) Tower on wall, Peking; (65) Part of the British Legation wall as it appeared after the siege.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.













# The Geographical Journal.

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## ON THE ROUTE OF BOLIVAR'S GREAT MARCH:\* CARACAS TO BOGOTÁ VIA ARAUCA AND THE PARAMO OF PISVA.

By Prof. HIRAM BINGHAM.

IN 1819 the armies of General Bolivar and Santander marched from the central Venezuelan *llanos*, crossed the Arauca river at Arauca and the Andes by the paramo of Pisva, defeated the Spaniards at Pantano de Vargas and the Bridge of Boyacá, and secured the independence of Colombia. I had always felt that the difficulties of this march, which has been likened to those of Hannibal and Napoleon, had been greatly overestimated. Anxious to learn the truth, I persuaded Dr. Hamilton Rice to assist me in an attempt to go from Caracas to Bogotá by way of this little-known region. We met in Caracas in December, 1906, and on January 3, 1907, started for Valencia by the German railway. Our outfit weighed about 1000 lbs., but the officials of this thrifty road made it weigh 1000 kilograms. A vigorous protest availed us nothing, and we were filched out of 325 bolivars (£13) for "excess luggage."

In Caracas we secured two West Indian negroes who knew some Spanish and rendered faithful service to the best of their ability in all sorts of ways until honourably discharged in Bogotá. In Valencia we added two faithful "peons" to our party. They walked across Venezuela in attendance upon our cart, the first wheeled vehicle to attempt such a journey. Besides the cart-mule we bought five saddle mules at

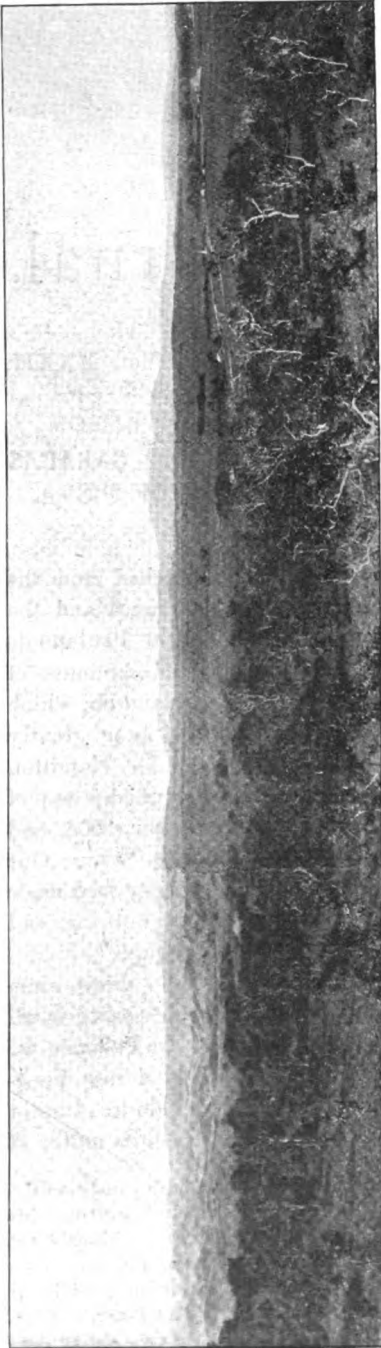
\* "His passage of the Andes was a mightier feat than Hannibal's passage of the Alps; his marches were longer than those of Genghis Khan and Tamerlane; his audacity in risking battles against odds equalled Marlborough's, while his patience under reverses, his skill in leading dispirited, half-mutinuous armies, and his never-failing ingenuity as a strategist, entitled him to the praise, somewhat grudgingly bestowed by Wellington, of being an extraordinary commander" (*The Times*, London, August 8, 1883). Map, p. 448.

prices ranging from £13 to £20. One of them lasted to the end of the

march, and was sold for £6 the day we reached the Bogotá railroad.

We left Valencia January 10, passed through Tocuyito, and camped for ten days near the battlefield of Carabobo. Several battles have been fought at this strategic point, where the roads from southern and western Venezuela unite. It is chiefly famous for being the site of the deciding conflict between Spain and Venezuela in 1821. So far as I have been able to discover, no map of the battlefield has hitherto been published. The region is very fertile, and supports quite a large population. The inhabitants are well fed, and fond of games — chiefly bowling and cock-fighting. In the woods are numerous birds, peccaries, venados (*Odocoileus gymnotus*), iguanas, and red squirrels (*Sciurus variabilis*). We saw no snakes anywhere in Venezuela except in the excellent zoological museum established by the Capuchin friars in Caracas.

We left Carabobo on January 21, passing through a hilly region over a wretched road that had been made by the late President Guzman Blanco. A new road leading from the plains of Carabobo to the central llanos was in course of construction. Beyond the hills lay the barren plain of Tinaquillo, where Bolivar reviewed his forces on June 23, 1821, before starting for the famous battle. The village of



PANORAMA OF THE BATTLEFIELD OF CARABOBO.

Tinaquillo lies on the banks of the sluggish little Guayavita. The fare at the inns hereabouts is not bad, and consists of soup, beef stew, eggs, fried plantains, maize cakes, and excellent coffee. And so it continued with little variation until we reached Barinas.

From Tinaquillo, our road lay south over a barren range of hills, another plain, and then more hills, these last rather more fertile and consequently more populous. The next day brought us to the beautiful falls of Tinaco. Although not at all remarkable, except that they were the only falls seen in Venezuela, the surroundings are wild and picturesque. A ravine about half a mile long has been cut by the falls, which are at present about 10 and 40 feet high respectively. The river is well stocked with fish, which are caught in an ingenious manner by the lazy fishermen. Wherever the fish are accustomed to jump the rapids of the shorter falls, the fishermen suspend baskets, which catch those individuals that make poor leaps. About 8 miles beyond the falls the road climbs out of the valley and descends on to the plain of Tinaco, the northern limit of the great llanos. Here the road branches out east, west, and south. The town is unattractive, but there are numerous shops and a comfortable inn.

The next morning we turned westward. Our road now became a succession of grassy plains divided by wooded streams. The government telegraph-poles with their single wire were the only guide posts, but we found them quite sufficient as far as Barinas, the end of the line. We now began to see quantities of small wild pigeons (*Zenaida vinaceorufa*), green parrots, and other birds of brilliant plumage, including macaws and parrots. About 13 miles beyond Tinaco we crossed a low, chapparal-covered ridge, and caught our first glimpse of San Carlos. In the time of Bolivar it was a place of great importance, boasted of 30,000 inhabitants and many wealthy citizens. To-day it has barely 3000 souls and a few interesting ruins. Earthquakes, revolutions, and cattle plagues have combined against it. A few companies of sad-eyed soldiers and a handful of *grafting* politicians hardly make up for its lost estate.

The ruins of the grand house where Bolivar is said to have been entertained shortly before the battle of Carabobo are most extensive, and cover a city block. Part of the outer walls are still standing. The corner room has recently been roofed over and turned into a butcher's shop. The ruins of another house not far away remind one of Italy, while those of the "Casa Blanqueria" are almost Pompeian. Painted frescoes, elaborate reliefs, carved wood ceilings, and tiled floors now shelter a polite but poverty-stricken family and their pigs and fowls. The exterior is decorated with caryatids that look like Incas.

We left San Carlos January 24, and entered a region of low foothills. The village of San Jose, 3 miles from San Carlos, has not twenty houses now standing, although it was once a place of some importance.

Beyond San Jose, the road crossed grassy savannas and wooded streams where bamboo thickets predominated. Occasionally one met wild bulls on their way to the bullfight. Each bull, with his head securely tied up in a sack, was attended by two or three *llaneros*, or cowboys. By a raw-hide lasso run through his nose the bull was fastened to the tail of a tame horse, on which rode the first *llanero*, whose mournful whistle, oft repeated, announced the approach of a wild animal. Another familiar sight on the roadside were the fires which the natives are fond of setting in the dry season. The dry grass and bushes burn rapidly for considerable distances, and at night look like lava-flows. This custom keeps down the rank prairie grasses and destroys the noxious insects and snakes.

At Camoruco, a hamlet of two or three houses, the western road divides, the left passing south of the last group of hills and going through the village of Cojedes, while the right road is the more direct and hilly route to Acarigua. We took the latter. The village of San Raphael has between twenty and thirty houses. Here the road from Cojedes to Barquisimeto crosses the western highway. Travellers to the Andean provinces turn to the right, unless they prefer the cart-road by way of Acarigua. A mile beyond San Raphael the road emerged from the hills, and we caught our first glimpse of the Cordillera. Occasionally an isolated hill cut us off from the plains, but for the most part the road skirted the llanos.

Agua Blanca, a small village with a couple of shops, is in the midst of a grazing country. But owing to revolutions and cattle plagues there are few cattle to be seen. In the 10 miles between Agua Blanca and Acarigua we were able to count but sixty-seven head, although the road leads over magnificent savannas that ought to support hundreds of cattle. On most maps Acarigua and Araure are some distance apart. As a matter of fact, they are practically contiguous, there being scarcely three-quarters of a mile of open land between them. Araure is much older, but stopped growing long ago, while Acarigua is the only place in the region that seems to be on the increase. It must have a population of nearly 3000. The cart-road to the Andean provinces goes north from here to Barquisimeto. Since the advent of the railroad at Barquisimeto, Acarigua has become somewhat of a distributing-point for the north-western llanos.

Most travellers who have made the overland journey from Caracas to Bogotá have gone *viâ* Barquisimeto, Merida, and Cucuta. A few have gone south from Caracas across the llanos *viâ* Calabozo and the Meta. But no one, so far as we were able to discover, had ever gone *viâ* the cities on the western edge of the llanos and Arauca. Accordingly we turned south from Acarigua, and passed through Aparicion, Ospino, San Raphael, Guanare, Tocupido, and Barrancas to Barinas before actually striking across the llanos. Aparicion has about twenty-five

inhabitants and a magnificent deserted plaza. Its one shop had quite a variety of goods, including cotton cloth, native hammocks, lager-beer from Caracas, "Extra Soda" biscuits from New York, "love-drops" from London, and water-melons from the proprietor's garden.

The region along the edge of the llanos from Tinaco to Guanare is a succession of savaunas hardly ever more than three-quarters of a mile across, and wooded banks of streams, sometimes dry. As we rode south, we had on our right foothills in process of erosion, with occasional glimpses of the higher Andes; on our left the plains; but the vision was always bounded by wooded banks of winding streams, so



EL SALTO DE TINACO.

that the horizon was never far distant. At Ospino, a quiet, unpretentious little town, we found two young Venezuelans, who had been to Caracas, and spoke a little English. One of them, the local "sport," had a "pack of hounds"—consisting of three fox-terriers—with which, and a revolver, he told us he often hunted both deer and rabbits! In Valencia we had seen a real pack of a dozen hounds, and had enjoyed hunting with them, notwithstanding the fact that their owner assured us one of them was "an English pointer, *elevated* in Denmark." In the early mornings we now heard the curiously attractive roar of the red, howling monkeys, "araguatos." Blackbirds, meadow-larks, "scissor-birds," and large orioles were common. We saw hundreds of lizards, but never a snake. Cattle and horses were very scarce.

San Raphael in Zamora is a straggling village of thirty thatched

huts. The savannas are smaller here; the jungle more impressive. Occasionally we saw a few monkeys. The rivers are full of fish. At an inn near the Portuguesa we saw a kind of salmon being dried in the sun. It measured 40 inches from the tip of the tail to the neck. The head had been removed. So far we had no difficulty in fording the stream, although in the rainy season it is said to be impossible for carts to use this road. Between Carabobo and Guanare we met perhaps five carts a day loaded with hides. The drivers were intelligent, hard-working peons, whose ability to guide their mules over the rough places in the "road" is quite extraordinary.

Five miles beyond the Rio Portuguesa is Guanare, to which the latest official statistics give a population of 30,000. We could not account for more than 2000 on the most liberal allowance for families. There are not more than six very small shops. The plaza is attractive, and the house in which Bolivar is said to have stayed has many signs of having been built by a wealthy man. We had a letter of credit from a German mercantile house in Valencia to the rich man of the town, who was most obliging, and furnished us with £50 in gold and silver without any difficulty whatever. There is a small college here conducted by priests. A league south of the city is the river Guanare, a magnificent stream, filled with islands and flanked by great jungles. In one tree on its bank we counted sixty-three egrets. Water-fowl are more numerous as one goes south. In fact, the fauna changes rather markedly after crossing the Guanare. Perhaps the reason is that the country is wilder. Few carts ever pass the Guanare, and the rarer animals are less wild. But flies and midgets were very troublesome.

Tocupido, once a thriving town with a large church built of masonry, is now a village of only forty thatched huts and a small thatched church. In order to get the cart across the Bocono we left the vicinity of the foothills and went across the plains towards Sabaneta. Even at this ford the sandy bottom is said to be treacherous, but the mule had no difficulty in pulling the empty cart across, while we were ferried over in a dug-out canoe about 25 feet long. The river was not over 4 feet deep. Sabaneta, 6 miles beyond the river, is a village of possibly fifty thatched huts. The people here were very friendly, and greatly enjoyed the novelty of our proceedings. In the course of the evening Rice got out his theodolite as usual to make a stellar observation, one of our men gave an exhibition of taxidermy, while I was busy in a dark corner of the living-room of the little inn changing my photographic plates.

In order to reach Barinas we now had to turn slightly north of west and follow the flood plain of the Bocono for 10 miles, until we reached the old trail near the foothills. Our road lay through the great forest jungle that lies for miles on each side of the Bocono. Trees with a

girth of 20 feet are not uncommon. I measured one whose girth was 26 feet, and whose spread was over 200 feet. Flocks of monkeys, quantities of birds, thousands of insects, and millions of ants made the day one long to be remembered. At one place on the sandy trail the ants had formed a living causeway over the fine sand of the path, in order to facilitate the great speed at which the majority wished to travel. The causeway was over 2 inches wide, and from one to three ants deep. So firmly did the "bridgeites" hold together, I lifted the causeway 4 inches from the ground by thrusting a stick underneath, without breaking their formation.

Our next stop was at Barrancas, a small village of twenty huts. From here to Barinas we had once more the familiar small savannas, low hills, heavily wooded river flood plains, few cattle, and almost no horses. For lunch we shot some guans, which the natives call *guacharaca* (*chaoholaca*). They need considerable cooking, but are palatable. Underestimating the distance to Barinas, we did not reach the ford over the Santo Domingo until long after dark. It is a rushing, roaring torrent, much like the Guanare, and we had considerable difficulty in finding a safe way across.

The most interesting ruin in Barinas is that of "El Marquez," a fine house, built about 1800 by a cattle king. It measures 138 feet by 114 feet. A charming patio, surrounded by graceful columns and surmounted by an attractive balustrade, gives a glimpse of the life here in the days of dependence on Spain. The owner is said to have been a loyalist, and was ennobled by his king and ruined by his countrymen. Barinas was once an important place, but the decay of the cattle industry has destroyed its greatness, and it can hardly boast of more than two thousand inhabitants to-day. The telegraph line ends here, and carts very rarely attempt to go any farther. Two years ago one went to Pedraza. We had intended to go to Pedraza, near which are some interesting Indian ruins, but we found that the only way for the cart to reach the Colombian frontier was for us to go *via* San Sylvestre (Totomal), Acanagua, La Boca Suripa, Palmarito, and Periquera (Nueva Guasualito). We now had to employ local guides from place to place.

Soon after leaving Barinas we lost sight of the mountains, and did not see them again for many weeks. The savannas grew larger and larger, until occasionally they seemed almost without limit. Several varieties of ducks and red deer constituted our daily bag for some time. We saw a great many water-fowl, egrets, ibis, herons, and jabirus. The last are magnificent storks, standing 4 or 5 feet in height, and with a spread of 7 to 8 feet from tip to tip of wing. "Goatsuckers," or "nightjars," lapwings, and many other birds make this a paradise for the ornithologist.

At the Paguei, a river resembling the Bocono, we were ferried across in a dugout. On its south bank lies San Sylvestre, formerly

Totomal, a poverty-stricken collection of a dozen thatched huts. We were now in the llanos of Apure, the home of the great President, General Paez. We stayed for several days at La Calzada, a ranch where he had lived as a boy. It is now owned by a thrifty Colombian, who raises sugar-cane, maize, yucca, potatoes, tobacco, and four varieties of beans. With a thousand head of cattle, nine leagues of land, a dozen house servants, and a few books, he lives far more comfortably than any of his neighbours. They rarely have any vegetables, except plantains.

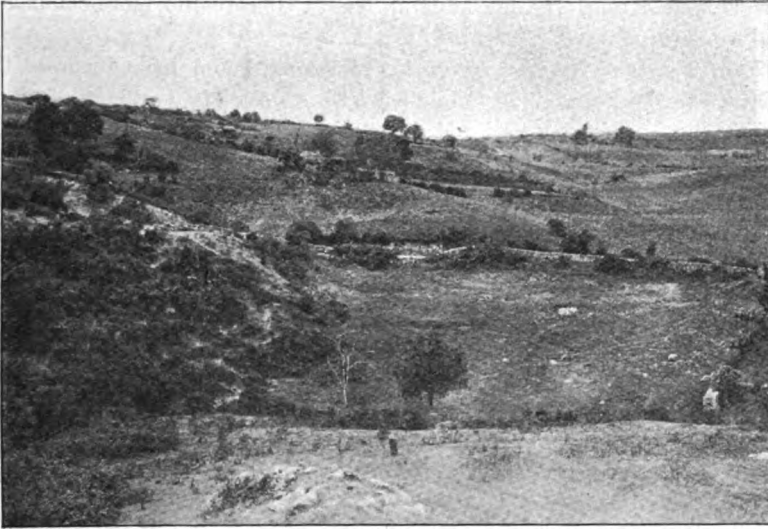
The temperature on February 8 varied from 64° Fahr. at 6 a.m. to 80° at 9 a.m., 86° Fahr. at noon, 89° Fahr. at 3 p.m., 82° Fahr. at 6 p.m., and 77° Fahr. at 9 p.m. This was an average day. The thermometer hung in the shade of the thatched roof. At sunrise there was no breeze. But it began at 6.30, grew stronger, and blew very fresh from 8 to 10, dying down at noon, and being very light and fitful in the afternoon. This was characteristic of our weather for a fortnight. This daily breeze from the north-east is the salvation of the hot plains. It makes it possible to work with comfort during the morning. Of course, one is supposed to sleep in the afternoon.

We crossed the Apure river at Boca Suripa, its juncture with the Suripa. The Apure was until recently the larger of the two rivers, but the Caparro has left its old bed some distance above Mamporal, and now empties into the Suripa above Sta. Rosalia, so that the latter stream has become larger than the Apure. This change in volume and force of the current is altering the region by creating new islands and destroying old ones. We saw more large alligators in the Suripa just above Boca than anywhere else in our journey. A canoe ferry is maintained here, and it is a favourite place for swimming cattle across the river. Our cart was placed, empty, amidships of a large dugout canoe, and safely navigated across the swift current. After crossing the Apure we found ourselves on the route followed by Bolivar's soldiers in their famous march of 1819. I left the caravan for two days to go up the Apure in a canoe, and joined Rice at Palmarito. I found my head-net and gauntlets of great use on the river, as the flies were a perfect plague.

We saw quantities of birds on the Apure, including two "king buzzards." They were twice as large as the common "Samur," had red heads, white bodies, white wings tipped with black, and black tails—quite regal-looking vultures.

A small river steamer comes up the Apure as far as Palmarito and Periquera in the wet season, from May to November. The result is that many of the houses have corrugated galvanized iron roofs instead of the picturesque thatch. In the dry season the principal business is the handling and shipping of cattle; but in the wet season, when it is almost impossible to handle cattle, the cowboys become bird-catchers, and penetrate the flooded jungles in canoes in search of the precious

egrets. A river trip down the Apure at this season of the year is not pleasant, for the wind blows so strongly up-stream in the morning that the canoes are often obliged to wait until the hottest part of the day (eleven to four), when the flies are at their worst. Going up-stream the conditions are reversed. One can sail for about three hours, enjoy the breeze, the absence of flies, and the cessation of labour on the part of the crew, who make slow work poling against the current. At night we camped on a sandspit, suspending our hammocks from drift-wood poles planted in the sand. The soil along the banks of the river seemed to be a mixture of clay and gravel. I rejoined the caravan



THE BATTLEFIELD OF BOYACA.

at Palmarito, a thriving little town of, perhaps, fifty houses. The most enterprising shopkeepers here are Syrians.

After leaving Palmarito we did not again see the Apure, although we paralleled it as far as Periquera. The country is quite wild, and one sees very few cattle. An occasional armadillo, red deer, ducks, jabirus, and golden agutis (or *pagaris*) are fairly common. Here we first noticed a mirage about noon. It extended for a distance of nearly 3 miles. The trees did not appear to be inverted, but rather raised completely from the plain. In the wet season the plains are a great swamp, which in the dry season looks in places like a frozen mud honeycomb. This makes the trail very rough for the cart. The poor cart-mule became quite exhausted, and the two peons who walked with the cart all the way from Valencia got very much discouraged. The people hereabouts differ from those in the cities of the north-west

llanos in being less suspicious, more inquisitive, less modest, more lazy, less honest, and much more hospitable. They appear to be a mixture of Spanish and Indian blood. One rarely sees any evidences of negro blood.

As we approached Periquera the savannas grew smaller, the chaparral increased, swamps became more frequent, and we lost the familiar sweep of the great plains. We found the road into the town so corrugated by the feet of animals in the wet season that it was quite impassable for the cart, which had to skirt the town and pass over the site of Guasqualito. Part of the church walls are all that remains. When steam navigation began on the Apure, its inhabitants moved over to the swamps near the river and built up Nueva Guasqualito, more commonly called Periquera.

On February 19 we arrived at El Amparo, and looked across the Arauca to the Republic of Colombia. El Amparo is a village of about fifty houses, some thatched and some with corrugated iron roofs, which testifies that it is a port of call for river steamers on the Arauca. The temperature here on February 20, in the shade under the eaves of our boarding-house, was 71° Fahr. at 6 a.m., 85° Fahr. at 9 a.m., 93° Fahr. at noon, 95° Fahr. at 2.30 p.m., 86° Fahr. at 5 p.m., and 79° Fahr. at 9 p.m. The chief articles of export here are hides and feathers. After some difficulty with the authorities, who took us for revolutionists and insisted that we had too many guns, we finally left Venezuela on February 22, and bade adieu to the cart and our faithful peons. They eventually got the cart back to Valencia and the mule actually lived to complete his 900-mile journey.

We spent a week in the town of Arauca, where we were most courteously entertained by the Government authorities, acting under orders from President Reyes. His kindness repeatedly made our journey in Colombia easier and more comfortable. Arauca appears to be as prosperous as the other river towns, although we were told its importance has much diminished since the Venezuelan Government closed the Orinoco, forcing all goods bound for Colombia *via* Arauca to pay Venezuelan duties at Ciudad Bolivar besides the Colombian customs at Arauca. One sees no Colombian paper money here. Venezuelan silver is the current medium of exchange. Colombian silver is worked off on strangers. Unable to secure any other pack-animals, we bought four oxen, which carried 225 lbs. apiece and walked 2 miles an hour without difficulty. These lasted us until we reached the mountains at Pore.

The usual way to go from Arauca to Bogotá is *via* Cucuta. The army of Bolivar, however, went directly to Tame, thence along the western edge of the llanos of Casanare to Pore, and from there by the paramo of Pisva to the Sogamoso valley. This route leads for the first 125 miles through a very wild region, inhabited only by savage Indians. Consequently it is avoided by the Colombians, and it was only after many

trials that we secured a guide who knew the way. Those who have business in Tame go *viá* Cravo, and our guide was very insistent that this was the only feasible route. We finally forced him to go "Bolívar's way," but he had his revenge in the difficulties we had to encounter.

We left Arauca February 29. The country in its immediate vicinity swarms with cattle and horses. We saw more stock here in one day than in all our journey across Venezuela. The next day we reached the last ranch before the "wilderness," just in time to escape a heavy thunder shower, our first rain in two months. Here we were detained several days by the loss of two oxen, which broke loose in the night and



MAKING A CHINCHORA HAMMOCK AT EL LIMBO RANCH.

returned to Arauca. The temperature on March 1 was 73° Fahr. at 6 a.m., 86° Fahr. at noon, 89° Fahr. at 3 p.m., 80° Fahr. at 6 p.m., and 76° Fahr. at 9 p.m. A few streams meander through the llanos here, and have cut so deep a channel that they have no flood plain and consequently no jungle. We saw nothing like these in Venezuela. The streams are the home of countless capybaras and small alligators. The ranch owner had many hundred head of cattle, rather more than the pasturage justified. As it was the end of the dry season, the grass was very poor and many of the cattle had died.

While we were delayed at the ranch, eight wild Indians (*Indios bravos*, *muy bravos*)—four men, three women, and a baby—arrived with the purpose of trading hammocks and twine in exchange for some large dogs that were raised here. The men wore nothing but breechclouts, and the women were not much better off. The men were armed with bows,

iron-pointed arrows, and spears. The chief was inclined to be friendly, but the younger ones were rather sulkily. The babies are carried in a small hammock slung over the mother's shoulder. We saw more members of this tribe after leaving the ranch. The Colombians are very much afraid of them, but they seemed quite friendly and peaceable. They speak but half a dozen words of Spanish, so our communication with them had to be largely by signs. They could none of them look one in the eye.

After crossing the river Lipa, which we forded without difficulty, we saw no more cattle until we reached the ranch called "Limbo," which is a day's ride from Tame. The savannas were covered with long grass. Sometimes it was higher than our heads as we rode. There was generally no trail to be seen anywhere, although once in a while we would cross an Indian path, or follow it for a short distance. The river Ele, 150 feet wide and 12 deep, would have forced us to build a raft had we not been able to secure a canoe from the Indians, who had a small village near the crossing-place. Our guide said they were Yaruros or Guajivos. Many of the men had had the lobes of their ears pierced. They reminded me strongly of Gilbert islanders. Many of the Venezuelan mestizos bear a striking resemblance to the mixture of Caucasian and Polynesian that one sees in the Pacific ocean.

Beyond the Ele the country was very wild and deserted. Almost no animals were to be seen, except occasionally a big stork standing alone in a marsh. The common ones are about 3 feet high, have a white breast, black tail and tips of wings, white head, neck, and wings, reddish spot around the eyes, whitish beak with a barb on top. The deer are far wilder here than in Venezuela. The Indians take the trouble to hunt them, while the Venezuelans are too lazy and prefer beef. The region is very swampy, even at the end of the dry season, while it must be practically impassable in the winter. The natives say that Bolivar's army used canoes, but this hardly seems likely; more probably they had to wade. To avoid one very bad swamp, we were obliged to follow the guide for 300 yards through a lagoon 4 feet deep. One of the mules lay down in the water, and was rescued only with the greatest difficulty. The next day another mule became hopelessly stuck in a bog, and finally had to be shot.

In the jungles of the Cravo river we passed through a deserted Indian village of twenty huts, or rather palm-leaf shelters, the largest 9 feet long and 6 feet high. The only food in the vicinity appeared to be the variety of palm that serves for thatching the houses all over the llanos, and which has a small date, of which monkeys are very fond. The guide said the Guajivos came here to avoid the floods. We saw no jaguars anywhere, but there was fresh spoor on the bank of the Cravo river, where we found a fording-place. The swamps now became much worse and more extensive, so that we progressed with great difficulty.

The oxen got very tired, and made for the dense jungle whenever they got a chance. Near the Cravo I saw several horned screamers (*Palmatoria cornuta*), lapwings (*Belonopterus cayennensis*), grey herons, red and white ibis, egrets, several varieties of ducks, and the rosette spoon-bill. Of quadrupeds the golden agouti and the venado were all we could see, and these very seldom, owing to the high grass.

About 4 miles from "Limbo," the first ranch on the west side of the wilderness, we came to the Caño Guato, an affluent of the Totumito. Recent rains had made it overflow its banks, so that for 2 miles the country was so drowned as to be impassable. We had to wait for three



THE PLATEAU AND VALLEY OF SOGAMOSO.

days until the floods had subsided sufficiently for us to reach its banks and effect a crossing. A boy from "Limbo," who came to help us, was bitten in the calf of the leg by a caribe. The wound was the size of a dollar, and proved to be very painful. As the little stream was over 10 feet deep, and its banks were 2 feet under water, the fording was not an easy matter. After breaking camp, it took us from 10 a.m. until 2 o'clock the following morning to cover the 4 miles to "Limbo." Our food-supply was nearly at an end, and we were glad enough to rest for several days at this hospitable ranch. Milk, cheese, plantains, and coffee never tasted better. The previous day I had shot two horned screamers, but the meat proved to be almost unfit for food, and made the men vomit. The larger bird measured 6 feet 8 inches from tip to tip of wing. The feet were like turkeys'. The wings had two pairs of spurs,

and the feather-bone horn on the head was over 3 inches long. "Limbo" belonged for twenty years to the revolutionary General Vargas. A souvenir of his ownership is a great wooden trough, in which he lay concealed for several days while the Government soldiers searched for him.

From Limbo we turned south-west to Casanare. The first day we saw nineteen deer, more than any day heretofore. They were excessively wild—began to run while we were half a mile away—so that it was quite impossible to get a shot at them. At noon we caught our first glimpse of the Andes since leaving Barinas. We saw no high peaks, only foothills rising 500 feet above the level of the plain. At the end of the day, March 16, we reached Casanare (Puerto San Salvador), and had a most unhospitable reception. We practically had to force an entrance into the enclosure of the posada. The people were very suspicious of our guns, and also of our guide, who was a noted thief. The village has but twenty huts, but is quite famous in history, as it was the headquarters of General Santander at that period of the Colombian war of Independence, when Spain had regained control of everything except the llanos of Casanare. The place now serves as a depôt for coffee, which is shipped in bungaloes (large canoes) down the Casanare to the Meta.

The fauna and flora here are like that near Guanare. Lizards were abundant, although we had not seen one for six weeks. There are no deer to be seen. Macaws and parrots are common, and so is a scavenging ibis called "boca." The region between Casanare and Corrazales is fairly well wooded. The most unusual tree was a small palm, 15 feet high, 3 to 4 inches in diameter, having truncated leaves like a "wine palm," and bearing a cluster of brilliant red berries like cherries, resembling in size and shape a large bunch of grapes. We saw no pebbles by the roadside or in the streams all the while we were in the llanos proper, from Barinas to Casanare. The plain appears to end abruptly at the foothills, but there is in reality a gradual rise of 2 or 3 miles to the hills.

Corrazales is a small village of thirty houses. The innkeeper did not like our looks, and denied the existence of food or lodging. Again we had to resort to compulsion. On March 18 Corrazales enjoyed its first shower of the year. The only money desired here is "billetes," the Colombian paper, which is at 10,000 per cent. discount. A Colombian nickel coin was refused in payment for a spool of thread. Here we saw the first stone wall seen since leaving New England.

Chire is a dirty little village of about thirty huts. We were accommodated in a new house, and were not told until afterwards that the owner had died of small-pox and been buried the day before our arrival. Potatoes, very small but quite palatable, are a common article of diet from here on to Bogotá. On March 19 we had a small shower. The

road between Chire and Moreno lies very close to the foothills, which are about 600 feet high, and seemed to be composed entirely of pebbles and boulders. Before reaching Moreno the road winds among hills which have little soil, support almost no trees, and are not dissected by erosion to any extent. The angle of the hills is about as steep as a pile of pebbles could be made to assume. The largest boulder seen was not over 3 feet in its greatest diameter. Occasionally we met small herds of oxen laden with bags of coffee from the hills near Tamara and Ten, bound for Casanare. A mirage, seen March 19, six hours before reaching Moreno, seemed to be an inverted image. It lay east-south-east from the road about noon.

The river Ariporo resembles the Guanare in appearance. It has cut



BOCA DE SURIFA FROM THE LEFT BANK OF THE RIO AZURE.

a beautiful terraced valley through the hills. There seems to be a second range of hills running north and south between the foothills and the mountains. Shortly before reaching Moreno the road climbed a slight hill, and disclosed a wonderful view. The valley of the Ariporo lay before us and above us. The high Andes shone in the sunset above the clouds to the north-west. With the glasses we made out two glaciers on the south side of one peak, and a large glacier on another. These must be near Cocui and Concepcion.

During the night of March 19, a heavy shower fell while we were in Moreno. More rain fell the following morning. It appeared to be the first of the season, and an intelligent resident of Moreno told me they had no rain from December to February. Beginning in March, the amount of rain steadily increases until the end of July. There is a marked diminution in August, so that the rainfall then is more like that of April. In September the rains return in full force, diminishing in November, and ceasing about December 1. I questioned a number

of persons in the llanos of Casanare quite closely about the weather, and their statements practically agreed with the foregoing. Moreno, once an important place, is now in ruins. It has hardly a hundred houses standing, and only two shops. There are a few "old families" here, and the one rich man had recently imported an upright piano from Hamburg. It was shipped *viâ* the Orinoco and the Meta to Trinidad, on the Pauta, thence overland on a rude cart to Pore, where it still is. Brito is a scattered village of twenty huts. Some of the adobe walls were of pink clay. A hot wind from the north-west became noticeable in Chire, and daily thereafter.

We spent a week in Pore, disposing of our oxen and making arrangements with a Syrian contractor to take our outfit on five good mules to the end of the railroad that runs north from Bogotá. On our arrival the annual fair of Pore was in full swing. The little town of sixty houses, some thatched and some tiled, was crowded to its utmost capacity. Ranch owners with stock, travelling merchants and pedlars with a very large supply of wine, beer, and liquor contributed to making things lively. The fair comes just at the end of the dry season. We received a royal welcome from the provincial alcalde, who was attending the fair. The Government telegraph wire reaches Pore *viâ* the Meta river, and President Reyes had sent messages which ensured us every consideration. On March 21, the morning after our arrival, it rained hard; "the first rain of the season" here. We seemed to have picked up the procession southward of the showers. After this we had showers nearly every day, but more commonly at night. During a heavy thunderstorm on March 27, at 2.30 p.m., the thermometer fell 12° in fifteen minutes (84° Fahr. to 72° Fahr.).

On our way from Pore to Nunchia we spent a night at Desecho, a famous ranch, where we experienced such comforts as French soap, Turkish towels, books, Bordeaux, various condiments, and excellently prepared food. We had had nothing like it for months, so it made a lasting impression. There are two ranges of hills between the llanos Nunchia. They differ from those north of the Pauta, and seem to be of disintegrating lava instead of pebbles and boulders. The lava resembles that on Oahu, H. I. The altitude of the first range where we crossed it was 2700 feet above sea-level, or 100 feet above the plains. The view was superb. The llanos stretched away to the south and east as far as the eye, aided by powerful glasses, could reach. Great savannas alternated with the wooded flood-plains of numerous streams, the characteristic scenery of the upper llanos. The second range of hills is 300 feet higher than the first. Both run at right angles from the ridges that come from the main Cordillera. They are roughly indicated on Codazzi's large map, which we found very useful and more accurate than any of its successors. We spent a week in the provincial capital of Nunchia. It is a growing little town, with possibly one

hundred and fifty houses, many of them having roofs of corrugated iron. Our saddle mules had not been shod for two months, as we found no blacksmiths in the llanos. The cargo mules had also to be shod here.

The trail from Nunchia to Morcote is nothing but a wretched excuse for a bridle-path. I dismounted fifteen times to help my mule over the steep rocky stairway that passes for a road. We saw a number of orchids and orchid-gatherers in this vicinity. Morcote has a fine old church in fairly good repair. It is 203 feet long and 53 feet wide. Yet there are not more than fifteen thatched huts in the village, which is located on top of a rather steep ridge. The trail from Morcote to Paya lies through a dense tropical forest, such as one sees in Jamaica or Hawaii. At its highest point the road is 5000 feet above sea-level. Paya has between forty and fifty houses. Near by is a rough stone-wall fort built by the Spaniards. It is an eight-pointed star, only 120 feet in diameter, so that the story of its being defended by 500 Spaniards against the troops of Bolivar and Santander does not seem likely.

At Paya we turned north-west and began to ascend the valley of the Rio Paya. The mountains are very green and wooded to their tops. The valley is deep and has terraces. On these terraces are several villages, including Paya and Pisva. The latter is a wretched place of thirty thatched huts, occupied exclusively by Indians ("*Indios malos, ladrones*"). They make hats and sandals of fibre, which are sold to the burden bearers that use the paramo of Pisva. There are many bees in the vicinity, and some wax is manufactured. The women also spin yarn. There are three other villages in this valley that do not appear on the maps—Pancote with fourteen huts, a league above Pisva and on the other side of the valley, and Jota with a dozen huts a league farther on. At Tovacar there are eight or ten huts. This is the last collection of huts until one crosses the paramo and descends into the valley of Sogamoso. The huts are very small, rarely more than 8 by 10 feet, and have only one opening, closed by a raw-hide door stretched over a rough frame. The trail became so bad we employed four Indians to help the cargo mules, each mule requiring the constant attention of an Indian to help him from smashing his load to pieces in the rocky gorges. Occasionally the loads had to be taken off when the trail was too narrow to allow a loaded animal to pass. Had the alcalde of Pisva not sent several men the day before to repair the worst places in the trail, we should have found it quite impassable. It is small wonder that Bolivar lost all his animals and many of his men when he passed through here in 1819.

The paramo of Pisva has the usual characteristics of Andean passes. It is cold, damp, bleak, swept with a chilly fog from the north-east, a wilderness of small thorny plants, solitary ponds, coarse grasses, and almost no animal-life. It varies from 10,000 to 13,000 feet in height above the sea. We spent a wretched thirty hours negotiating its

slippery trails and resting from our efforts. During the night in the paramo the thermometer went to 31° Fahr. But the cold was intensely penetrating, and kept us from getting much sleep. Only one of the five saddle mules bought in Valencia succeeded in reaching the pleasant valleys beyond the paramo.

We reached Laguna Seca (Socha Nueva) on April 14. It is a tidy little town, high up on the side of the valley of the Sogamoso. The country hereabouts is very fertile and supports a large population. The houses are more often tiled than thatched, and small villages are very common. Wheat and sheep-raising appeared to be the chief occupations. An occasional water-power grist-mill added a picturesque quality to the scenery. The valley is very wide, possibly 3 or 4 miles, and a couple of thousand feet deep.

Socha, where Bolivar made his headquarters while recuperating from the passage of the Andes, is now a small town of no importance. Adobe walls and gates are very common throughout this part of Colombia. The towns have walled cemeteries, frequently circular in form, and often located conspicuously on the hill above the town.

Tasco is a thriving place, the present terminus of the telegraph service on the east side of the valley. We crossed the Sogamoso, in a gorge of great beauty, between Tasco and Corrales. It was very difficult to estimate the number of houses or inhabitants in this part of the journey, for the towns are so compact, land being greatly in demand for agricultural purposes. Furthermore, this region is not difficult of access and the official figures appear to be fairly correct.

We stayed at Duitama long enough to explore the interesting battlefield of Pantano de Vargas, where the British Legion covered itself with glory and saved the day for Bolivar, Santander, and Colombia. It was here that the gallant Colonel Rook lost his life. Duitama is famous for its fruit. In an orchard I saw peaches, apples, and oranges all doing well. From here to Bogotá is a cart road. Most of the way it is macadamized and well made. The other parts are in course of improvement. On this plateau the thermometer rarely rose above 60° Fahr. The plateau has the distinct appearance of having once been a chain of lakes. It is 9000 feet above the sea.

Near Paipa we visited some springs where the water appeared to be boiling hot. Our only remaining thermometer did not read above 115°, and burst in a vain effort to record the temperature of the springs. The water is heavily charged with sodium sulphate. A small plant, owned by a German, did a good business here, before the last revolution, supplying this necessary mineral to the bottle factory of the Bogotá brewery. The plant is now in ruins.

Passing through Paipa and Tunja, we stayed at the battlefield of the Bridge of Boyaca long enough to make a brief survey of it, and then pushed on through Choconta and Hato Viejo to Nemocon. The railroad

was nearing completion (April 25), but regular trains were not running, so we went to Zipaquira, where we took the train for Bogotá, which we reached April 27, 1907.

The contrast between Venezuela and Colombia is very marked. The former country is still suffering from revolutions and bad government, while the latter, under the intelligent administration of General Reyes, seems to be making rapid strides forward. In regard to the difficulties of Bolivar's famous march, we came to the conclusion that the half had not been told.

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### DR. STEIN'S EXPEDITION IN CENTRAL ASIA.\*

EARLY in December, 1907, I had reached from Turfan Karashahr, in the extreme north-east of the Tarim basin, and there I commenced my archæological explorations of the winter. Sites of ancient towns of some size could be traced at several points of the Great Plain, now mainly a waste covered with scrub and low jungle, which encircles the Bagrash lake on the north—witnesses of the importance which the territory of ancient Yen-k'i had possessed in pre-Mohammedan times. But the vicinity of sub-soil water, often impregnated with salts, and the effects of a climate evidently less dry than in other parts of the great Turkestan depression, had completely destroyed whatever structures might have once stood within the still extant clay ramparts. Chinese coins, picked up by me on the spot, made it possible to determine that these sites had been occupied down to the ninth century A.D. A far better field for systematic excavations was offered by an extensive collection of ruined Buddhist shrines, locally known as *Ming-oi* ("the thousand houses"), which occupies some low rock terraces at the easternmost foot of the range overlooking the Karashahr river from the south. Situated within easy reach of the high-road leading from Karashahr to Korla, the ruins had repeatedly been visited by European travellers, including Dr. Hedin, and within the last few years Prof. Grünwedel's archæological expedition, on its passage to and from Turfan, had effected excavations in some of the structures less buried under *debris*.

The disposition of the ruins in long rows of detached cellas, varying in size but all showing close resemblance in plan and construction, facilitated the employment of a large number of labourers. Thus, with relays of men easily obtained from the Korla oasis, the complete clearing of the ruins could be pushed on rapidly. Already the first diggings showed that, apart from the destructive effects of rain and snow, the temples had suffered much damage by a great conflagration which, in view of coin finds reaching down to the ninth century A.D., may safely

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\* Communication from Dr. Stein, dated Khotan, July 15, 1908.

be connected with the earliest Mohammedan invasions. But in spite of all the destruction caused by iconoclastic zeal and atmospheric influences, there remained plentiful archæological spoil. A great mass of excellent relieve sculptures in stucco once adorning the temple walls, emerged from the deep layers of *débris* filling the interior of the larger shrines; from vaulted passages enclosing some cellas we recovered fine fresco panels which a timely burial had saved both from fire and moisture. Finds of painted panels and delicately carved relieves in wood, once richly gilt, bore proof of lavish adornment with votive gifts which these shrines had once enjoyed. Considering the relatively late date down to which this sacred site had been occupied, the artistic excellence of many relieves, etc., was all the more striking. Notwithstanding some manifest differences of style, these sculptures and paintings yet displayed, quite as clearly as the art work of ancient Khotan, the predominant influence of Græco-Buddhist models from the extreme north-west of India. The manuscript remains recovered were either in Indian script or Uighur. Considering the great number of temples, the total absence of ruins which could with certainty be recognized as monastic dwellings, was a curious feature of this site. But if the living seemed to have been averse to taking up their abode with the gods, it was otherwise with the dead, for cinerary urns and boxes were unearthed in numbers around some of the shrines and stupas.

I could not trace in the vicinity any remains pointing to early occupation by villages. Yet the wide plain stretching eastwards, a desolate waste of scrub and sand, could even now be easily brought under irrigation by canals from the Karashahr river. Whatever changes desiccation may have effected in this region it seems certain that the supply of water now available in the Karashahr river far exceeds the needs of the narrow strips of land actually cultivated, chiefly by colonies of restless Tungans and semi-nomad Mongols, and that only the want of adequate population at present prevents a great extension of the cultivated area. I found, subsequently, similar conditions prevailing in the neighbouring oasis of Korla, where the population consists of industrious Turki-speaking Mohammedans.

During the weeks spent at Ming-oi we worked under quite Sarmatic conditions. Light snow fell almost daily, and the icy vapours sent forth by the great lake and marshes south rarely lifted above camp and ruins. So, after the completion of our tasks by Christmas, it was a relief to move up to the cold but sunny hills of Khora, two marches above Ming-oi, where information, elicited with much trouble from Korla shepherds and reticent Mongols, had led to the discovery of Buddhist ruins hitherto unnoticed. We found there a series of small temples and monastic dwellings built on rugged cliffs overlooking the wide stony valley of the Karashahr river, and curiously recalling by their position and character

those ancient Buddhist sanctuaries I had so often surveyed within and across the Indo-Afghan border. In spite of their secluded position, the shrines had not escaped iconoclast fury; but remains of fine wood-carvings and other relics recovered helped to illustrate the original richness of their decoration. Surveyor Rai Lal Sing had rejoined me at Ming-oi, after making his way from Turfan towards Korla, largely through previously unmapped portions of the Kuruk-tagh ranges. Further west these seem to be less barren than had been supposed so far, and to be regularly visited by Mongol herdsmen. Our visit to the Khora ruins gave Rai Lal Singh an opportunity for useful surveys on the range dividing the Karashahr valley from the open plain of the Tarim basin.

The new year found us at Korla, where, with the north-east end of the great sandy desert close by, I felt as if returned once more to my own ground. Stories of sand-buried towns in the desert haunt popular imagination in the northern oases almost as much as to the south of the Taklamakan; and the particularly definite form in which certain Korla hunters presented reports about large ruins seen by them in the narrow desert belt between the Charchak and Inchike river-beds induced me to test them here. The well-defined limits of the track indicated, and the absence of special difficulties about water-supply, made it possible to effect a thorough search of this hitherto unsurveyed area. This proved of distinct geographical interest by showing in typical form the changes brought about by shifting river-beds in the adjoining jungle belts, but revealed in the end, as sole real substratum for those reports, only remains of old Mohammedan tombs and of rude shepherd huts close to former river channels. Physical conditions make it appear very improbable that this area could ever within historical times have seen any large permanent settlement, as distinct from semi-nomadic herdsmen, such as are still to be found all along the Tarim and Shahyar rivers. But of course the negative result of our careful survey could make little impression on guides, imaginative yet *bonâ fide*, who with true Eastern reasoning would look upon the invisibility to our eyes of such imposing ruins as illusion fostered by traditional beliefs had shown them, merely as a proof of adverse magic prevailing against us!

From the Inchike (or Shahyar) river we marched over hitherto unsurveyed ground to Kuchar, Lal Sing following the course of that river right through to its debouchure from the mountains, while I myself struck across the broad belt of waterless desert to the north-west. The oasis of Kuchar, owing largely to its central position on the great northern trade route, had from an early period played an important part in the political and cultural history of the Tarim basin. Several extensive groups of ruined cave temples and other shrines, near where the oasis is bordered by the foothills, attest the flourishing condition of Buddhism during the centuries preceding conversion to Islam. But these ruins from which important finds of old manuscripts had reached

India since 1891, had in the course of the last five years been searched by successive parties of Japanese, German, and Russian archæologists and finally cleared with methodical thoroughness by the recent French mission under Prof. Polliot. So, after a week's halt, which was utilized for visits to these ruins and a rapid study of their specially instructive features, I was free by the close of January to resume my journey to the south of the desert.

Inquiries set on foot by me since leaving the Khotan and Keriya region in the autumn of 1906, had resulted in information reaching me about several ruined sites in the Taklamakan which had remained unexplored so far, and I was anxious to visit them before the heat and the season of sandstorms would make work on that ground impossible. A march due south through the desert to where the Keriya river dies away in the sands, certainly presented difficulties and possibly risks. But Dr. Hedin's pioneer journey of 1896 showed that it was practicable under certain conditions, and as there were ruins to be visited near the lowest course of the Keriya river, the hope of saving time by this "short cut" decided me to attempt it. The main difficulty was that while Dr. Hedin, coming from the south, had the line of the Tarim river at right angles before him as a broad and certain goal, our hope of reaching water within reasonable time from the opposite side depended on our steering correctly across some 130 miles of bare dunes towards a particular point and on the assumption that the Keriya river after an interval of twelve years still actually carried its dying course there. However much my reliance on Dr. Hedin's mapping was justified by previous experience, differences of longitude were bound to be considerable on such deceptive ground, and over the true sea of sand intervening there was nothing to guide us but the compass.

On January 29 we left the last shepherd huts in the Tarim jungle, and after a trying tramp of eight days, across high dunes, reached the northern edge of the dried-up delta, which the Keriya river had formed at some early period. There was nothing here to indicate the right channel in the maze of dry river-beds, all half buried by drift-sand, and often disappearing completely amidst jungle dead since long ages. Nowhere in the course of my desert travels had I met ground so confusing and dismal. So far, at a few places, we had been able to dig wells, and the scanty water they yielded had allowed us to husband our ice supply. This, and the severe cold still prevailing, assured safety of our relatively large party, though attempts to dig wells failed us again and again in this forbidding dead delta, and the river was not reached until six days' further march to the south. It had formed a new bed far away from the one which Dr. Hedin had followed, and the sands through which it now flowed were still absolutely sterile. It was a great relief when I at last sighted, from a huge ridge of sand, the glittering ice-sheet in the distance; for our camels had tasted no water for fully a fortnight,

and there was no small risk of the labourers I had brought from Shahyar, for the sake of eventual excavations, being tempted by their growing alarm into flight, and thus probably into destruction. It took several days more before we arrived at living forest, and found the river-bed branching off from the old one, close to the northern-most point I had reached on my journey of 1901.

The ground we had passed through had its own fascination, and survey work on it offered a good deal of geographical interest. Yet I was glad when, after a day's rest at a shepherds' camp by the Keriya Darya, I could resume archaeological labours at the Kara-dong site which I had visited on my previous journey, and which the river, by its latest shifting, has approached—again after long centuries. In 1901 a succession of sandstorms had prevented a complete search of that site, and the shifting of dunes had since laid bare some ruined dwellings then too deeply buried beneath sand. The excavation of these now furnished definite antiquarian evidence that a small agricultural settlement had existed here far away in the desert during the early centuries of our era. Having been joined on the Keriya river by a party of my old "treasure-seeking" guides from Khotan, I marched with them by a new route to the desert edge north of the oasis of Domoko. There in the deceptive zone of scrubby jungle and high tamarisk-covered sand cones, they had succeeded in tracking a large but much-scattered series of ruins which had remained unknown to us during my previous explorations in this vicinity, and had escaped also Mr. Huntingdon's painstaking search in 1905. The remains, comprising, besides numerous dwellings, also several Buddhist shrines, resembled closely those I had excavated in 1900-01 at Dandan-oilik far away to the north, and proved to have been abandoned about the same period at the close of the eighth century A.D. In view of interesting geographical questions connected with physical changes in this region, it deserves to be noted that this site reaches within a few miles of the village of "old Domoko," which was abandoned to the desert some sixty years ago owing to difficulties about irrigation, but is now being slowly approached again by extending cultivation. This vicinity to an occupied area had, of course, resulted in much damage to the ruins. Yet in the end my excavations were rewarded by valuable finds in the shape of well-preserved manuscripts in Indian scripts, Buddhist paintings on wood, etc.

March and the early part of April were thus spent in archaeological labours along the desert belt adjoining the oases from Domoko to Khotan. Amongst the ruins newly traced there, I must restrict myself to mentioning the remains of a large Buddhist temple, decorated with elaborate frescoes, now completely buried by high dunes in the desert strip between the Yurung-kash and Kara-kash rivers. Like the large Rawak Vehara which I discovered in 1901 in a closely corresponding

position not far from the opposite bank of the Yurung-kash, this temple proved to belong to the early centuries of our era. Unfortunately, subsoil moisture had weakened the walls to such an extent that continued excavation threatened to result in complete destruction.

After having been rejoined by Rai Lal Singh, who had in the mean time completed a detailed survey of previously unmapped ground in the north-west and north of the Khotan oasis, we set out by the desert route which leads towards Aksu along the Khotan river-bed, then practically dry throughout. It had long been my wish to look for ancient remains on the curious desert hill of Mazar-tagh which flanks the Khotan river on the west, some six marches below the oasis. My hope for archaeological work here was fully justified by the discovery on that desolate ridge of the ruins of a fortified watch-station once guarding the river route. The fort had been destroyed by fire, but on the steep rock slope below, big masses of refuse thrown out by its occupants in the course of long years had fortunately remained in excellent preservation, safe from moisture and driving sand. From this unsavoury quarry we recovered a great collection of documents on wood and paper, in a variety of scripts, mainly Indian, Chinese, and Tibetan, and none apparently later than the eighth and ninth century A.D. The great mass of these records evidently belongs to the period of Tibetan invasions, and closely corresponds in appearance and character to the records brought to light by me last year from the ruined fort of Miran south of Lop-nor.

A reconnaissance pushed north-westwards showed that the Mazar-tagh is not an isolated hill, but indeed a low range stretching far away into the desert, as assumed by Prjevalsky and Carey who first saw it. In the absence of actual survey the fact had since been doubted. Direction and geological structure alike point to its being a continuation of the ancient chain of which portions survive further to the north-west about Maralbashi.

By the beginning of May we reached Aksu, having suffered a good deal *en route* from the heat of the desert and sandstorms. At Aksu I was able to arrange, through the help of my old mandarin friend, Pan-Darin, now Taotai, for the local help which Rai Lal Singh needed for the continuous survey he was to carry along the outer Tien-shan range westwards as far as the passes above Kashgar. I myself travelled up the Uch-Turfan valley, and thence marched by a route not shown by published maps across a barren but remarkably picturesque mountain range to the oasis of Kelpin. In spite of peaks rising from 12,000 to 13,000 feet, water is now very scanty throughout these mountains.

The way in which obvious desiccation has affected the conditions of Kirghiz herdsmen grazing in the valleys, and the survival among them of local lore unmistakably of pre-Mohammedan origin, offered interesting objects of study. Information opportunely secured through "treasure-seekers" of Kelpin led to the discovery of extensive *débris* areas, marking

ancient settlements in the desert belt between the arid outer hills of Kelpin and the lowest course of the Kashgar river. Far-advanced erosion had left little or no remains for excavation, but enough archaeological evidence was secured to prove that this tract, once traversed by the ancient Chinese high-road to Kashgar, had been occupied down to the eighth century A.D. by large settlements to which canals still traceable in parts carried water from the Kashgar river. There was opportunity here also for interesting topographical work, as my survey revealed a series of low parallel ranges, which continue to the north-west the line of the curious rugged hills about Tumshuk and Maralbashi shown by extant maps as isolated rock islands.

The proper season for work on such arid desert ground had long passed when regard for the tasks awaiting me at Khotan obliged me, towards the end of May, to stop my explorations about Maralbashi. A rapid journey *via* Yarkand brought me by the middle of June back here to Khotan. The arrangement and packing of my archaeological collections, accumulated during two years' labours, are bound to prove an exalting task, seeing how extensive they are and how much care is needed to prevent damage to often fragile antiques on the long and difficult transit to India. Thus I am likely to be kept hard at work in Khotan until the close of July. Since my arrival I have had the great grief of seeing Naik Ram Singh, of the 1st (Bengal) Sappers and Miners, who had accompanied me from the commencement of this journey, and had rendered very useful assistance about photographic work, plans of buildings, and other tasks needing a "handy man," return from a journey to Charlik, on which he had started for a supplementary task towards the close of March, with complete loss of eyesight. He had left me in what seemed fair health, and without any sign of approaching eye-disease. The misfortune of the poor sufferer, who has been sent with all needful care to Yarkand for medical treatment, causes me greatest concern.

After completing my tasks at Khotan, I hope to carry out, with Bai Lal Singh, explorations in those parts of the high Kunlun range about the Yurung-kash and Kara-kash sources which still remain to be surveyed. Then, late in September, we may be able to start on the return journey to India over the passes of the Karakorum.

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## VICINITY OF LAKE TE ANAU AND MILFORD SOUND, NEW ZEALAND.

By Prof. R. MARSHALL, D.Sc., F.G.S.

THE presence of seals and whales in the fiords and off the south-west coast of New Zealand in the early years of this century, was the cause of the exploration of the coast-line long before anything definite was

known of the richer, and at the present time vastly more important, eastern agricultural districts of the dominion. The numbers of seals soon diminished in consequence of the reckless slaughter, and the whales were more conveniently tried out at Stewart island and on the southern coast of the mainland. As a result, the western coast was almost deserted even by these casual visitors long before the middle of the century.

It was accurately surveyed, and the fiords were partially sounded by the *Acheron* in 1857, but no settlement followed, and even at the present day the deep and secure inlets are almost uninhabited.

There is a lighthouse at Puysegur point, saw-milling and fishing stations at Preservation and Chalky inlets. At Dusky sound there is a Government resident in charge of the sanctuary for native birds at Resolution island, and at the head of Milford sound there is an accommodation house for tourists who walk over the Mackinnon pass from Lake Te Anau. Elsewhere this wild and storm-beaten coast with its far-reaching fiords enclosed by beetling precipices, with its dense forests of evergreen beech, with its mountain peaks streaked with glaciers, is still as unaffected by the colonization of the land as in the days of Captain Cook.

Some 40 miles to the eastward there is a nearly continuous line of lakes—Te Anau, Manipouri, Monowai, Pouteritari. From the lakes fiords penetrate westward into the rugged mountainous country, as do the marine inlets on the seaward side. On the eastern shore of the lakes the country changes. The shores are less abrupt. Bush is replaced by grass-lands. The plutonic rocks give place to soft Tertiary sediments, through which rise ranges of folded Mesozoic slates.

The contrast in climate is as great as that in vegetation and topography, for all over the region to the west of the lakes the rainfall is between 150 and 250 inches per annum, while to the eastward it diminishes to 40 inches.

This area between the lakes and the Tasman sea is a physiographic unit. Throughout its area its features are similar though widely different from those of the country to the east. It is true that characteristics not widely divergent in climatic and vegetational and mountainous features are continued into the country to the north, but when the Darvan mountains (north-east of Milford sound) are passed, the nature of the rock changes, the valleys are less abrupt, the fiords end, and the line of lakes is more interrupted and retreats further eastward.

The coast-line has been described as desolate and uninhabited, but these words are still more descriptive of the interior portions, for there are no inhabitants with the exception of a few guides, who, during five summer months, occupy the accommodation houses that have been erected by the Government for the shelter of those tourists who

# SKETCH MAP of the COUNTRY between MILFORD SOUND and TE ANAU LAKE

By PROFESSOR R. MARSHALL, D.Sc.

Nat. Scale 1 : 300,000 or 1 inch = 4.73 Stat. Miles.

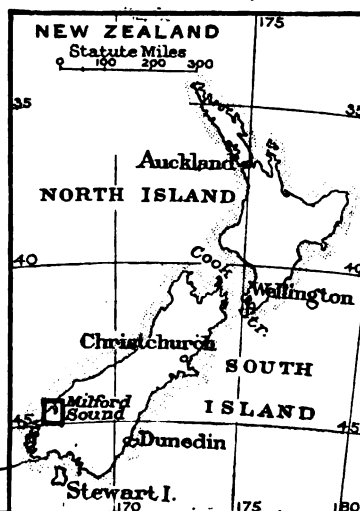
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MILFORD SOUND

TE ANAU  
LAKE

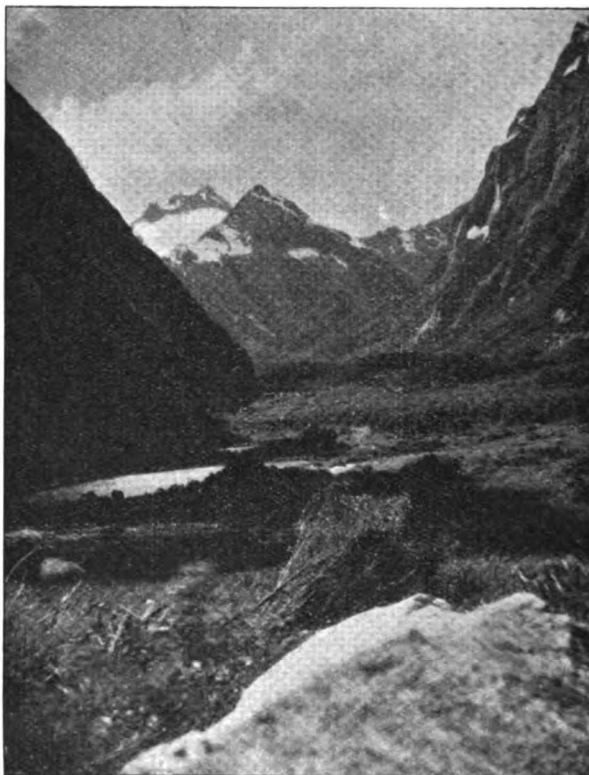
1. Clinton River.
  2. South Branch Clinton R.
  3. North Branch Clinton R.
  4. Arthur River.
  5. Joe's River.
  6. Neale Burn.
  7. McKinnon's Pass.
  8. New Pass, 4550 ft.
  9. Iceberg Lake, 3800 ft.
  10. Lake Ada.
  11. Baloon Peak
  12. Mt. Mitchelson
  13. Mt. McKawzia
- ..... Tourist Route.  
+++++ Explorers' Route.  
----- Mr. Grave's Route.

True North



undertake the journey of 35 miles from the head of Lake Te Anau to the furthest recess of Milford sound.

Even more, for much of this country which lies within 50 miles of large and productive sheep stations and within 200 miles of Duned—a town of sixty thousand inhabitants—is still unexplored. Nor is this due to want of energy and enterprise on the part of the colonists, for

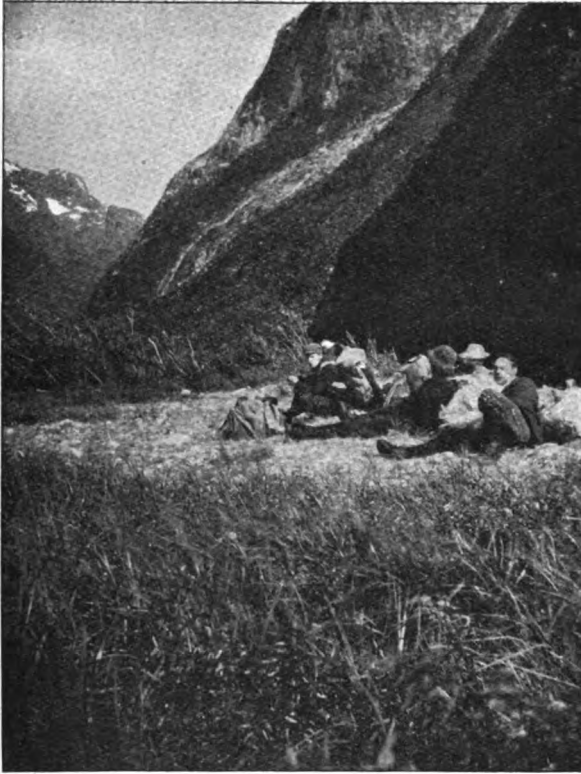


NORTH CLINTON VALLEY FROM NEAR ITS HEAD, 2000 FEET ABOVE SEA-LEVEL.  
AVALANCHE TARN IN MIDDLE DISTANCE.

wherever land that offers any advantages that allow of possible occupation occurs, it has been seized upon and utilized to the best advantage.

In the more northern portions of the wet zone of the west, mining enterprise has led Europeans to make their homes, but in this area of plutonic rocks there is no mineral contained in the stream sands at the heads of the fiords in sufficient quantity or of sufficient value to encourage miners. The timber is seldom of good enough quality to tempt the saw miller, while on the small plots the difficulties of clearing the forest in the wet climate are sufficiently great to deter the agriculturist.

This area of 10,000 square miles remains practically unoccupied. It has lately been proclaimed a Government reserve, so the beauties of forest and stream, of mountains and valley, of calm fiord and storm-beaten coast will remain here untarnished. The future colonist will from these forests be able to actually view the trees that at one time covered a large portion of the land, and see the strange birds that gave such interest to the wilds in the early years of colonization.



SUMMIT OF AVALANCHE TALUS SLOPE.

From time to time expeditions have crossed this forest land from lake to ocean, and little by little our knowledge of it increases. Tracks have been cut through the bush and over a few of the lowest passes by the Government, but the rapid growth of the vegetation, the destructive force of the spring avalanches and the flooded streams make constant work necessary in order that these tracks should be kept in a fit state for ordinary travellers. At the present time, the track from the head of Lake Te Anau to Milford sound is the only one that can be traversed without encountering considerable difficulty. The natural features of

this route have been lately described by Mr. Andrews, of Melbourne, in the *Journal for Geology*. For colouring of stream, rock, and forest, for magnificence of mountain and glacier, for grandeur of waterfall and precipice this route is unsurpassed in accessible districts of New Zealand.

Hitherto the route followed—only 35 miles in length—has been the only known route to Milford sound. Elsewhere the precipitous rock-walls, everywhere over 2000 feet in height, have been supposed to present an insuperable barrier. So far as the regions to the south are concerned, this appears to be correct, as has been shown by Mr. W. G. Grave, who for three consecutive summers has made attempts to traverse the mountain barriers. His journeys are described in some detail in a paper that will shortly be published in the *Transactions of the New Zealand Institute*.

To the north an attempt was made by Mr. W. Quill, who apparently attempted a pass from the head of the Cleddan to the head of the Hollyford, but lost his life in the endeavour.

It was with the object of adding to our very limited knowledge of this interesting district that a party was organized in January, 1906. It consisted of six men engaged in various branches of education in New Zealand—Dr. Marshall, Messrs. W. G. Grove, A. E. Flower, A. G. Grenfell, R. Browne, G. Talbot. All were qualified by previous exploration experience in this type of country. In estimating the comparatively small result achieved, it must be remembered that all food supplies have to be carried, for there are no indigenous vegetable products of an edible nature. The few native birds are jealously protected from harm by law regulations, and it was our wish to abstain from any action that might increase the rate at which their numbers are gradually decreasing even in this out-of-the-way district. The dense bush entirely prevents the use of transport animals, and financial considerations prevented the employment of packers. For these reasons it was necessary to carry goods of 60 lbs. each, which included twenty-one days' food. Even in summer the weather is liable to be cold enough, for sleet showers and heavy rain is certain to be experienced, for in this region the summer precipitation is heavier than that of the winter.

The rough nature of the ground, the heavy bush consisting of trees matted together with dense undergrowth and interlacing climbers, rendered progress with the heavy swags extremely slow. The undergrowth is constantly saturated, the ground is often swampy, and from time to time the foaming rapids of the stream offer the only available path. An explorer is saturated throughout the day. At night the waterproof sleeping-bag keeps him dry, but the wet clothes have to be put on again for the morning's start.

The actual ground selected for the expedition was the north branch of the Clinton river. The south branch is followed by the present track. It was hoped that a pass might be found that would lead into

the drainage basin of Milford sound or into the basin of the Hollyford, from which Lake Wakatipu could be reached.

The progress of the expedition was slow, for with the most strenuous exertion half a mile per hour was the fastest rate of travelling, and it was seldom that a greater distance than  $3\frac{1}{2}$  to 4 miles was attained in a day's journey.

The valley was found to have an estimated length of 14 miles. At



HANGING VALLEY ON ROUTE LEADING TO PASS 1070 FEET HIGH.

its entrance its floor is 750 feet above sea-level. Throughout it is bounded by precipitous walls of plutonic rock, diorite, and gneiss, attaining almost everywhere a height of 2000 feet. From the summit of these walls the mountain peaks rise to a further height of 4000 feet. The peaks themselves are often precipitous, but as a rule the slopes near the valley bottom are steeper than those at higher levels. The floor of the valley is often flat, but frequently it is strewn with masses of irregular boulders of gigantic size. Upon and among them grows the most luxuriant vegetation, and the whole forms a complex that is

well-nigh impenetrable. In some cases these blocks represent old rock-slides, but more frequently they are old morainic masses left behind when there was some temporary halt in the retreating glacier that once filled the valley. In many cases the rock-walls rise vertically from the flat floor without any intermediate slope of talus, but after the annually recurring avalanches of spring bring down masses of *débris* that form small cones extending some hundred yards into the valley, which is usually about 500 yards wide. Wherever hedges give a foothold, clumps of trees have established themselves, and such patches occur at intervals almost to the top of the rock-walls. In many places the growth of vegetation is prevented by the annually recurring avalanches, which bring down snow in such volume that masses of it still remained at an elevation of 900 feet at the end of January.

Several of these avalanche slopes ended in tarns 100 yards or more in diameter, and since I can find no description of such features as these "avalanche tarns" elsewhere, a brief explanation of their formation may perhaps be admitted.

The first avalanche of spring is composed of the outer layers of snow only, which carries no *débris*, but forms a large wide-spreading cone at the foot of the slope. The avalanches that fall later on are composed of snow, that was actually in contact with the rocky face. They carry down huge masses of *débris* that roll down the slope of the previous cone, and accumulate round its margin. As the summer advances, the avalanche cones of snow melt, and the marginal *débris* encloses a basin more or less circular, within which the waters of the tarn are enclosed. Usually a waterfall courses down the rocky face and tumbles into the tarn, so these features add beauty as well as interest to the sights of the valley.

The flat floor rose slowly and uniformly, and finally terminated in a well-defined cirque at 3500 feet above sea-level, 14 miles from the valley entrance. The floor of the cirque was partly covered with snow, and the mountain-slopes above were also snow-clad. The bush, which in the lower part of the valley was chiefly "birch" (*Notogagus menziesia*), changed to "ribbon-wood" (*Plagianthus lyalli*), and, in places where the water hung and swamps were formed, grasses and sedges replaced the bush. Everywhere on the avalanche cones, which are found abundantly on the sides of the valley, representatives of the Alpine flora were flowering freely. The white-flowered *Ranunculus Celinisias* in many species, Angelica, Craspedia and many other genera, added their quota to the general effect.

The walls of the cirque rose very steeply to a height of 3000 feet above the floor, and it was found impossible to scale them, and all idea of climbing over to the western slope from the head of the valley was abandoned, and we were forced to retrace our steps. At the only bend in the valley 2 miles from the cirque a view of the northern face of

Balloon peak was obtained. The peak appeared as abrupt from this point of view as it does from the south, where its dominating mass always excites the interest and wonder of those who travel over the McKinnon pass from Te Anau to Milford.

A snow-storm soon concealed the peak, and through the sleet and rain we returned to a point 5 miles distant from the lower end of the valley. Here a stream enters the north branch of the Clinton over a hanging valley, and the slope of the bounding wall being here less severe, offered a chance of reaching the ridge that bounded it.



CIRQUE AT HEAD OF NORTH CLINTON VALLEY.

The ascent was commenced on a brisk south-west day when patches of blue were appearing in the sky, that for more than a week had been covered with a grey pall. The slope up the cascade proved 1050 feet in height and extremely steep, but at this height a valley  $1\frac{1}{2}$  mile long with a bottom almost flat was reached. At its end was a waterfall 540 feet in height, but the mountain scrub growing by its side enabled us to climb to the top. The stream flowed out of a lake three-quarters of a mile long and half a mile wide. It was bounded by high mountains

on the south, north-west, and north-east, but to the east and north the walls rose to only 600 feet above the water. The dip to the east proved to lead over the Neale burn, another tributary of the Clinton, but the dip to the north proved to be a practicable pass of 4600 feet altitude to the western slope. At the northern foot of the pass a stream flowed eastward, but when afterwards followed by Mr. Grove it was found to turn to the north, and was finally identified as Joe's river—a stream whose outlet into Lake Ada, near Milford sound, is well known.

The lake on the summit, Iceberg lake, is a perfect example of a rock-basin. Except to the north, where there is a flat a few square yards in extent, the mountain-sides dip straight into its water without any change of slope, and its outlet passes over a lip of solid rock.

Throughout this description it will have been noticed that the features of the main valley are those usually considered as characteristic of valleys formed by glacial erosion. The typical U shape—with steep sides and flat bottom—the lateral hanging valleys, the terminal cirque, the absence of over-lapping space, all point to this conclusion. The U shape of the hanging valley itself and its rock-basin lake from which it was fed are confirmatory of this conclusion.

The features of this valley, as described above, are common to the many hundreds of valleys of this grand country; but in most instances there is less simplicity. In the Route burn, the Greenstone, and the Clinton, when the main stream is joined by large tributaries nearly equal to it in size, they enter at grade, and there is usually a sharp descent in the main stream immediately above the junction. Many of the streams that flow in hanging valleys issue from rock-basins, as Lake Harris in the Route-burn valley, Lake Quill in the Arthur, to quote two out of numerous examples.

There can be no doubt in the mind of any one who knows this country that the very similar—almost identical—features extending over the whole country from Preservation inlet to Milford sound, and even further north, are due to the action of the same general cause. The great contrast between the forms of mountain and valley found here and those found in the elevated region of the North island, prove that—even after allowing for the difference in rock structure—different agents must have sculptured the country in the two areas.

The frequent presence of glaciated rocks in the fiords; of huge moraines to the east of the lakes; the great depths of the fiords, 1500 feet; of the lakes, 1600 feet; and of other glaciated valleys, prove that the whole area has been traversed by huge glaciers.

Steep as are the sides of the valleys, straight as is their alignment, their uniform depth and width, the different directions of different valleys, and their abrupt cirque terminations, prevent one from describing them as infallen areas, trough faults, or graben. There is no evidence, so far as my observation of the country is concerned, in favour

of beheading and intercepting of streams, as described by Garwood, to account for hanging valleys in the Himalayas.\* There is no change in rock structure to account for rock-basins, as described in Canton Ticino.† The flat bottoms of the valleys, varied only by sudden steps, the comparative absence of alluvium except at the outlet, combine to render any explanation, based on the erosive action of running water, inapplicable.



ICEBERG LAKE, SHOWING WESTERN RANGES OVER THE PASS.

For these reasons the author believes that in this region, at any rate, the peculiar features of the valleys are due to the flow of ice-streams along them. The directions of the valleys were in all probability, in the first place, due to ordinary stream erosion before the colder climate of the Pleistocene allowed of the accumulation of snow and ice in sufficient quantity to form the glaciers that afterwards developed valley, lake, and fiord basins.

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\* *Q.J.G.S.*, vol. 58, p. 703.

† Garwood, *Q.J.G.S.*, vol. 62, p. 165.

## THE NINTH INTERNATIONAL GEOGRAPHICAL CONGRESS.

By GEO. G. CHISHOLM.

THIS Congress met at Geneva and held its sittings from July 27 to August 6, under the presidency of Dr. Arthur de Claparède, President of the Society of Geography of Geneva, Honorary Corresponding Member of the Royal Geographical Society of London, etc. It was attended by 740 members and associates, an exceptionally large number, a fact no doubt largely due to the convenient geographical situation combined with the natural attractions of the place of meeting.

Honour was done to the Congress both by the federal authorities of Switzerland and the cantonal authorities of Geneva. At the opening meeting two ushers in uniform, one federal and the other cantonal, stood at the foot of the presidential chair, which was occupied by Dr. Ernest Brenner, President of the Swiss Confederation, and one of the honorary presidents of the Congress, who opened the proceedings with an address of welcome. In this address he bore testimony to the growing interest in geography manifested in Switzerland since the (Fifth) International Congress met in the capital of the country in 1891, and declared that it was the unquestionable merit of that congress to have contributed to the transformation of geographical education which has since taken place in the schools of Switzerland. In connection with this, he also drew attention with just pride to the great outlay made both by the Confederation and the cantons in the interest of geographical education in the primary and secondary schools, and mentioned that the association of the heads of departments of public instruction in the Swiss cantons was now engaged, with the support of the Confederation, in the preparation of an atlas for use in the secondary schools, which was to be followed by another designed for the primary schools.

Dr. Brenner was followed by Dr. A. de Claparède, who, after expressing his thanks to the federal and cantonal authorities for the reception given to the Congress, gave a brief review of the previous congresses. Acknowledgments from Captain Cagni, delegate of the Italian Government, as representing the state delegations, Prof. Gerland (Strassburg), as representing the University delegates, Prince Roland Bonaparte, as delegate of the pioneer geographical society, that of Paris, representing all the geographical societies, and from Prof. Davis (Harvard), as representative of other organizations, closed the meeting.

The Congress then at once proceeded to business. Two hundred and thirty-five papers were offered to and accepted by the organizers of the Congress, but a considerable number of them were not read owing to the absence of the writers or any authorized representatives of the writers of the papers, and few abstracts were available of those which were read. The number actually read, however, was very large. The papers were distributed among fourteen sections, surely an excessive subdivision, viz.

(1) Mathematical Geography and Cartography (Pres., Lieut.-Colonel Held, Bern); (2) General Physical Geography (Pres., Prof. Penck, Berlin); (3) Vulcanology and Seismology (Pres., Dr. Johnston-Lavis, Naples); (4) Glaciers (Pres., Prof. Brunhes, Freiburg); (5) Hydrography—Potamography and Limnology (Pres., Prof. Forel, Lausanne); (6) Oceanography (presided over by Prof. Krümmel, Kiel, in the absence of Sir John Murray, Edinburgh); (7) Meteorology and Climatology along with Terrestrial Magnetism (Pres., Prof. Hellmann, Berlin); (8) Biological Geography (Pres., Prof. Casimir de Candolle, Geneva); (9) Anthropology and Ethnography (presided over by Prof. Lenz, Prague, in the absence of Prof. Hamy, Paris); (10) Economic and Social Geography (Pres., Prof. Eug. Oberhummer, Vienna); (11) Exploration (Pres., Prof. O. Nordenskiöld, Gothenburg); (12) Geographical Education (Pres., Prof. Davis, Harvard); (13) Historical Geography (Pres., Prof. Cordier, Paris); and (14) Rules and Nomenclature (Pres., Commander Roncagli, Rome).

The sections were all conveniently and comfortably accommodated in the rooms of the University and the Athénée, and as a result of the excessive subdivision of sections, in order to reduce so far as possible the difficulty of enabling the members to be present at the reading of all the papers in which they are interested, the sections did not all meet on the same days. Alternate days were devoted to the meetings of the odd-numbered and even-numbered sections. Further, the meetings of the sections were confined to about two hours in the afternoons, and certain papers, considered to be of more general interest, were selected for reading in the mornings in the Aula or great hall of the University, where the opening meeting of the Congress was held.

The first paper so read was that of M. Alex. Moret, joint conservator of the Musée Guimet, Paris, on the confirmatory evidence in support of the account of the Periplus of Africa under Pharaoh Necho II., as given by Herodotus, afforded by the recent discovery of two scarabs with hieroglyphic inscriptions, recording, in one case, the return of the navigator who accomplished the voyage, and, in the other, the whole course of the voyage. The communication was received by the audience with much interest, but not without expressions of reserve on the part of some of them.

The morning sitting of the second day of the Congress was taken up with another paper which excited very general interest—that of M. W. Rosier, Councillor of State, and President of the Department of Public Instruction, canton of Geneva, on the “Proper Domain of Geography as a Branch of Education.” The reader of the paper contended that, regarded from that point of view, geography has for its object “the reading of maps and the scientific description of the Earth; that is, of the various constituents, animate and inanimate (*des éléments divers, physiques et vivants*), the combination and interconnection of

which determine the actual physiognomy of the globe; that it is divided into mathematical, physical, biological, and human geography, this last being again subdivided into historical, political, and economic geography." At a meeting of the education section on the afternoon of Monday, August 2, this account of the function of geography as a branch of education was brought forward by M. Rosier as a definition proposed for adoption by the Congress, and, as such, was the subject of an interesting and animated debate, in which Profs. Ricchieri, Davis, Telles, Vidal de la Blache, Chodat (rector of the University of Geneva), and others took part. From various points of view, the proposal of M. Rosier was subjected to criticism, and no satisfactory conclusion was arrived at. It should here be mentioned, however, that at the original reading of M. Rosier's paper in the Aula, an excellent wall-map of Switzerland for school purposes was exhibited, and much applause (and no doubt secret envy) was aroused when it was mentioned that this map was distributed gratis by the federal authorities to all the schools in the Confederation.

M. Rosier was followed at the morning sitting in the Aula on the second day of the Congress by Prof. Flahault, Director of the Botanical Institute, Montpellier, who, in an extremely eloquent address, dwelt on the practical importance of the study of botanical geography as a means of increasing the available resources of the Earth, and strongly urged on his hearers the duty of taking every opportunity of conveying to those who were in a position to use such knowledge any information of that kind of which they were possessed. Prof. Oberhummer of Vienna then gave an able lecture on Leonardo da Vinci and the Art of the Renaissance in their relation to geography.\*

The third day in the Aula was devoted to the consideration of glacial theories. The first paper was that of Prof. Penck, based on observations made by him, indicating the lower limit of perpetual snow in the Alps during the glacial epoch. His observations showed, he contended, that the glacial *névés* did not ascend much above their present level, and that it was only the lower part of the glaciers which extended far beyond the limits of the present epoch, and this could be attributed, therefore, only to a lowering of temperature (not, indeed, very great in amount) during the glacial epoch, not to an increase in the quantity of snow precipitated. Corroborative facts in support of Prof. Penck's views were mentioned by Profs. Chodat and Martonne (Lyons); and Prof. Forel, having mentioned that his studies on the glaciers of the present day had revealed an extraordinary parallelism between glacial phenomena and the thermal variations of the three summer months, maintained that the further prosecution of such researches might afford a very valuable aid to the study of the glacial epoch.

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\* To be published in the *Geographical Journal*.

Prof. Penck's paper was followed by one by Prof. Brunhes (Freiburg, Switzerland) on the mode of glacial erosion. Illustrating his subject by numerous lantern-slides, he emphasized the distinction between U-shaped glacial beds and V-shaped torrent-beds, and insisted that a glacier was to be regarded, not merely as a mass of ice, but as composed of ice and water, and that the erosive action of the glacier water, as modified by the presence of the ice, was at least as important as that of the ice itself.

On the fourth day of the Congress, Thursday, July 31, no meetings were held, but on the day following the proceedings in the Aula were in various ways important. Precedence was given to the expression of congratulations to the Geographical Society of Geneva on reaching the fiftieth anniversary of its foundation, the occasion of the invitation being addressed to the Congress by the city of Geneva. Letters of congratulation were read from the King of Roumania and the King of the Belgians, and then Prof. Oberhummer presented to the Genevan Society a copy of the magnificent volume of historical maps which had been prepared by the Imp. Royal Geographical Society of Vienna, on the occasion of its completing the fiftieth year of its existence, in the previous year. Several communications relating to polar exploration followed. Commander Cagni, the explorer who has approached nearest the north pole in the Old World, read a letter from Prof. Peary. Mr. J. P. Tolmachev, Conservator of the Geological Museum of the Academy of Sciences, St. Petersburg, then made a report on a projected expedition, to start in 1910, for the exploration of the Taimur peninsula and Cape Chelyuskin, a region of which there was no exact topographical record, owing to the destruction by fire of the documents derived from the first survey. Afterwards M. G. Lecointe, Director of the Observatory of Uccle, Belgium, gave an account of the International Polar Commission, founded at Mons in 1905; and at the conclusion of this paper, the meeting adopted the following resolution, several delegates refraining from voting: "That the Ninth International Congress, held at Geneva in 1908, expresses the hope that the Governments interested will consider with the utmost good-will the request which will be addressed to them by the provisional bureau of the International Polar Committee to give their support to that committee."

The sixth day in the Aula was mainly devoted to the Antarctic regions. Prof. Otto Nordenskiöld, with the aid of splendid lantern slides and excellent maps, gave an account to a most enthusiastic audience of the Swedish expedition to those regions, and indicated the main conclusions to be derived from the observations made in the course of the expedition. Afterwards M. Henryk Arctowski gave a brief review of Antarctic problems presented for solution as the result of the various Antarctic expeditions made to the present date. The sitting concluded with an exhibition by Prof. Gaetano Platania, of Acireale, of cinematographic representations of an eruption of Stromboli.

On Monday, August 3, Herr Filchner, an officer in the German army, gave an account of his explorations, during which he was accompanied by his wife, in eastern Tibet, in the upper part of the basin of the Hwang-ho. On Wednesday, August 5, two interesting papers were read at the last general meeting held by the Congress for such business. One of these was a paper on "Free Ports," by Prof. Blondel, member of the Society of Commercial Geography of Paris, who, after giving a sketch of the *rôle* played by free ports in history, went on to consider the function of their modern representatives, the zones in certain ports exempt from customs duties, and concluded by indicating the losses which France incurred from her exaggerated protectionist policy leading her to refuse to recognize the free port even in this form. The other paper was by Prof. Eug. Oberhummer, on the geography of great towns, a subject which, the author contended, was of interest in Europe only since the Renaissance, inasmuch as before that time even the largest towns of Europe were quite small as compared with those of China. In a brilliant address, which, it is to be hoped, will soon be available for perusal in full, Prof. Oberhummer set forth the great variety of considerations that have to be taken into account in dealing with this subject.

On August 4, M. de Lallemand, Engineer-in-Chief of Mines, Paris, read a paper, which excited a great amount of interest, on the periodic movements of the Earth's crust analogous to the tides. These movements were ascertained by the deviation in the oscillations of the pendulum from the rate calculated for an assumed perfectly rigid earth; but the deviation was so small as to baffle all efforts to determine it, until at last the difficulties were overcome by Prof. Eckert at the Geodetic Institute at Potsdam. This paper was followed by a communication from Dr. Léon W. Collet, privat-docent, Geneva, on the investigations of the Scottish lakes made under the direction of Sir John Murray.

From the numerous papers read at the sectional meetings, it is difficult to make a selection that can be considered as fairly representative in the limited space that can be afforded in the pages of the *Journal*, but it must be understood that many papers of interest were read besides those here referred to.

In Section I. (Mathematical Geography) the papers read included the following: "The Survey of Egypt," by Captain H. G. Lyons, F.R.S., Director-General of the Survey of Egypt; an account of the results of the levelling operations in France from 1899 to 1908, by Mr. Ch. Lallemand, Paris, the director of the operations; a statement of the results of railway levellings in European Russia employed as a hypsometrical base, by General Schokalsky; an account of the operations in connection with the delimitation of the Anglo-French frontier north and south of the Gambia, by Mr. A. B. B. de Tscharnier;

"Artistic Work in Cartography," by Colonel F. Becker of the *État Major*, Zürich, a paper which excited some discussion in which Colonel Held, Profs. Wagner, Oberhammer, and others took part. The paper by Captain Lyons on the "Survey of Egypt" was divided into two sections, the first giving an account of the present state of the survey and the maps which have been produced, and the second describing the peculiar conditions under which the survey was carried out. The author stated that "within the last ten years a complete series of cadastral maps on the scale of 1:4000 or 1:2500 have been published for the whole of the cultivated lands of Egypt, and by the end of the present year a series of maps on the scale of 1:50,000 for the same area will have been completed, and considerable progress has been made with a series of maps on the scale of 1:10,000." The triangulation in the Nile valley has been made the starting-point for other triangulations in certain parts of the desert area, as, for example, one just begun along the Mediterranean coast west of Alexandria, and one already effected in the eastern desert between 22° and 26° N., with a view to the accurate determination of mining claims and concessions.

Among the papers read in Section II. (Physical Geography) were one by Dr. J. van Baren (Wageningen) on the "Morphological Structure of the Diluvium north of the Rhine in the Netherlands;" one by Mr. J. J. Sederholm (Helsingfors) on the "Geomorphology of Finland;" one by Prof. Martonne (Lyons) on the "Systematic Position of the Chain of the Carpathians;" and one by Prof. W. M. Davis expounding a series of illustrations devised by him for teaching purposes to assist the student in realizing the nature of certain geomorphological processes. Those shown were only a few selected examples, and similar illustrations, the lecturer stated, were used by him in connection with meteorology and other branches of geographical teaching.

Section III. (Vulcanology and Seismology) was opened the first day by a paper by the President, Dr. Johnston-Lavis, on the "Mechanism of Volcanic Activity," which gave rise to a discussion in which Profs. Velain (Paris), Hobbs (Michigan), and others took part. Among other papers read in the section were: "The Relations between Tectonic and Seismic Conditions in Western Asia," by Prof. Rudolph (Strassburg); "Great Oceanic Depths considered from a Seismical Point of View," by the same author; "A Comparison between the Two Great Oceans as regards their Liability to Earthquakes," by Prof. Gerland (Strassburg); "A Review of Volcanic Theories," by Prof. Ch. Velain, based on his own labours, as well as those of Suess, Lacroix, Michel-Levy, Lapparent, Armand Gautier, and Albert Brun; and an account by Prof. Forel of the labours of the International Seismological Association.

As already stated, some of the most interesting work connected with the subject of Section IV. (Glaciation) was done in the general sittings held in the Aula, but among the other papers of this section may be

mentioned that of Prof. Cvijić (Belgrade), on "Pleistocene Elevations as a Cause of Glaciation;" that of Prof. Loozy (Budapest) on "The Relations between the High Glacial Terraces and the Three Fluvial Terraces of the Plains of the Middle Danube;" and that of Prof. Hamberg (Upsala) on "The Parallel Structure of Glacier Ice."

In Section V. (Hydrography) the President, Prof. Forel, read a paper on "The Origin of the Fishes of Lake Lemán," in which he expressed the conclusion that in post-glacial times there must have been a communication between that lake and the Lake of Neuchâtel. Some of the most interesting papers belonging to this section were read at a joint meeting with Section VII. (Meteorology). At that meeting a paper was read by General Schokalsky on the fluctuations in the level of the lakes of Central Asiatic Russia, in which it was pointed out that there had been a rise in their general level in recent years, a fact opposed not only to the theories held of a general desiccation now going on, but also to what was to be expected in accordance with Prof. Brückner's theory of a thirty-five year period of temperature and rainfall. In a subsequent paper Prof. Woeikof pointed out that the data as to temperature and precipitation derived from several Russian and other stations were also discordant with Prof. Brückner's theories. An animated discussion followed, in the course of which Prof. Brückner replied to his critics.

In Section VI. (Oceanography) Prof. O. Petterson read an interesting report on the work done by the International Council for the Exploration of the Sea, whose headquarters are at Haarlem (Netherlands), and Dr. Gerhard Schott (Hamburg) spoke of the latest oceanographical work done by the German navy.

In Section VII. (Meteorology, etc.) one of the most important papers read was that by the president (Prof. Hellman), giving an account of a new method of estimating the fluvial régime of a locality. Prof. Kassner (Berlin) exhibited and described his meteorological globes designed for use in teaching.

In Section VIII. (Biological Geography) Prof. Jaccard (Zürich) showed that the distribution of vegetable species followed a mathematical law in respect of their degree of frequency; Prof. Tanfilief (Odessa) demonstrated the preponderant influence of the temperature of soil in determining the limits of species and especially forest limits in Russia; and Dr. Hochreutiner, Conservator of the Botanical Museum, Geneva, treated of the affinities between the flora of Madagascar and those of the extreme east and south of Africa.

In Section IX. (Anthropology) Prof. Lenz, the acting president, read a paper comparing the Jewish populations of Abyssinia and Morocco; Prof. Colòcci (Catania) read one on the migration of peoples, and more particularly on the immigration into the west from Central Asia. An interesting address on Chinese art, illustrated by a fine

collection of Chinese paintings, was read in the same section by Mrs. Olga Julia Wegener.

The papers read in Section X. (Economic and Social Geography) were very numerous. Prof. Vidal de la Blache, one of the vice-presidents, read a paper on the geographical interpretation of regional units (*des paysages*), in which he showed the influence of climate, valleys, slopes, etc., on the distribution of human settlements and cultivation. Prof. Alfred Bertrand described the country of the Barotse, formerly explored by him. Dr. Day (Washington) spoke of the oil-bearing deposits of the world; Prof. Brigham (Hamilton, New York State), of the numerous and complex factors affecting the distribution of population in the United States; \* His Excellency Oliveira Lima, Brazilian Minister at Brussels, on the method of penetration into the interior of Brazil; Prof. Blondel (Paris), on the development of Hungary, Miss L. A. Owen (St. Joseph, Missouri), on the Missouri river and its future importance to the natives of Europe; † M. César de Givenchy, on the economic and social evolution of Tunisia since the establishment of the protectorate.

In Section XI. (Exploration) Captain Harfeld (Brussels) gave an account of his explorations in the Chinese province of Hunan; Baron Hulot, general secretary of the Society of Geography, Paris, set forth the results of the recent French explorations in Algeria and Tunisia and the regions behind them; Mr. H. L. Bridgman (New York) sent a paper on the history and field work of the Peary Arctic Club; and a paper by Dr. W. S. Bruce (Edinburgh), on his explorations in Prince Charles Foreland, Spitsbergen, 1906-1907, was read in his absence by Miss Newbiggin, D.Sc., editor of the *Scottish Geographical Magazine*.

Mention has already been made of one of the most important discussions in Section XII. (Education). Among other papers read in that section were one by Dr. Silva Telles (Lisbon), on the teaching of geography for advanced students; one by Count A. de Fleuriau on the teaching of geography by school journeys; one by Dr. A. Michieli (Treviso), on international vacation courses in geography; and one by Prof. Hobbs (Michigan), describing an ingenious apparatus designed to enable those learning geography to realize the meaning of contour-lines by determining and plotting those of model earth-forms, much in the same way as an engineer actually determines and plots the contours of the Earth's surface.‡

In Section XIII. (Historical Geography) the president (Prof. Cordier) presented to the Congress his memoirs on the Consulate of

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\* Published in the present number of the *Geographical Journal*.

† This paper, we understand, will appear in full in an approaching number of the *Scottish Geographical Magazine*.

‡ The full account of this apparatus will appear, we understand, in a future number of the *Scottish Geographical Magazine*.

France at Canton in the eighteenth century, and on the general correspondence relating to Cochin-China, 1785-91, and read some notes on recent explorations made by the French in Eastern and Central Asia. He also laid on the table a manuscript of M. Hamy, of Paris, on the voyage of André Michaux in Syria and Persia in 1782-85, which will be published in the Report of the Congress, and in the name of M. H. Vignaux, principal secretary to the embassy of the United States at Paris, he presented to the Congress that author's work on Toscanelli and Christopher Columbus, as well as a volume in which M. Vignaux proves that the date of the birth of Columbus is 1451. In the same section the Brazilian minister at Brussels gave an account of the negotiations of his country with almost all her neighbours for the settlement of her frontiers by arbitration or treaty; Prof. Ed. Naville (Geneva) gave a very full account, supported by references to authorities, of the commercial relations of ancient Egypt with neighbouring peoples; Count Teleki (Hungary) showed his collection of ancient Spanish and Portuguese maps of Japan, which will be published at Budapest in October; Dr. Scott Keltie (who was elected one of the vice-presidents of the section) read a paper on recent geographical progress in Great Britain; M. de Luigi (Milan) exhibited a Chinese map of the world, compiled by a Jesuit missionary in the seventeenth century, which he had found in the Ambrosian Library at Milan; and Mrs. Z. Nuttall (Coyoacan) sent to the Congress an unpublished account of Drake's circumnavigation of the globe, given by his prisoner the Portuguese pilot, Nuño de Silva, before the tribunal of the inquisition in Mexico, on the 23rd of May, 1579.

Of the papers read in Section XIV. (Rules and Nomenclature) one excited animated discussion. It was that prepared by Prof. Ricchieri (Milan), and presented in the joint names of Profs. Cordier (Paris), Sieger (Graz), Ricchieri, and of Mr. Chisholm (Edinburgh), proposing the appointment of a commission to study the question of the transcription of geographical names. In the end the meeting adopted the proposal, and at the general meeting of the Congress held for the consideration of general resolutions, the following resolution was unanimously adopted: "That the Congress should appoint a commission of seven members charged with the duty of studying the question of the transcription of geographical names in all its aspects, . . . with the view of preparing a complete report of such a nature that the next Congress may be able to come to a definitive conclusion on this important question." The mandate of the commission is to terminate one year before the meeting of the next Congress, and its report is to be published at that date. Profs. Cordier, Penck, Ricchieri, Sieger, and Mr. Chisholm were nominated as members of the commission, with power to select the two other members.

In addition to those already mentioned, the following resolutions

and recommendations were adopted at general meetings of the Congress. At the meeting held on July 28 a resolution with regard to the map of the world on the scale of 1 : 1,000,000 was unanimously adopted in the following terms :—

“Whereas the map-making offices of several nations are engaged in compiling maps, to be published on a uniform scale of 1 : 1,000,000, under uniform agreements as to limits of sheets, etc.—

“Resolved that it is desirable, for manifest reasons, that a uniform set of symbols and conventional signs be adopted by all nations for use upon these maps.

“Resolved that an International Committee should be formed to consider the question, and that, in order to provide a basis for the discussion, each Government and other map-producing office should be requested to supply to the committee, within the next twelve months, specimens of the 1 : 1,000,000 maps which have been produced.”

In accordance with this resolution, the president of the Congress nominated a provisional committee to consider the question, to report to the Congress, and make the necessary recommendations. The committee met, and unanimously adopted the following recommendation : “That the thanks of the Congress should be expressed to the Governments of France, Germany, the United Kingdom, and the United States for having begun the execution of this important work, and that the results of their efforts should be communicated by the Congress to the other Governments interested in cartography.”

The committee proposed, further, that the following recommendations should be communicated in the name of the International Congress to the Governments interested and to the geographical societies represented at this Congress :—

“1. In accordance with the recommendation made by the International Geographical Congress held at London in 1895, each sheet of the map should embrace an area of 4° in latitude and 6° in longitude. The limiting meridians of the sheets should be at successive intervals of 6° reckoned from the meridian of Greenwich, and the limiting parallels at intervals of 4° reckoned from the equator. The meridians and parallels should be drawn on each sheet for each degree.

2. The projection, according to the recommendation of 1895, should be polyconic, that for each sheet being constructed independently on its middle meridian.

3. A kilometre scale should be given on each sheet. An additional scale in miles might be added if desired.

4. The altitudes above sea-level should be inserted in metres. Heights in feet might be added if desired.

5. Contour-lines should be marked at vertical intervals of 200 metres, starting at sea-level; but in very mountainous districts the vertical intervals might be greater, provided that they were multiples of 200

metres. In very flat countries additional contour-lines might be given provided that the intervals were fractions of 200 metres. These lines should be drawn in brown. Minor features which cannot be indicated by contour-lines should be shown by shading. As a complement to the contour-lines, it is desirable that the successive zones of altitude should be indicated by a system of colour tints. A definite scale of tints should not be decided upon until after the preparation of specimen sheets on the general lines of these recommendations.

6. Generally water should be shown in blue, but a distinction should be made between perennial and non-perennial streams. The depths of the sea and of lakes should be shown by blue contours, the vertical intervals being multiples or fractions of 200 metres. Features which cannot be shown by the contours may be shown by blue shading. The datum level in each case is to be the surface of the sea or lake. In the case of rivers, rapids and other obstructions to navigation are, as far as possible, to be indicated.

7. Roads and tracks should be divided into two classes —those which are suitable for wheeled traffic, and those which are not.

8. The lettering should be in varieties of the Latin characters. A distinction should be made between the lettering applied to cultural (artificial) features and the lettering applied to natural features. In those cases in which the Latin characters are not in use in the country in which the sheets are produced, two editions should be published, one the national edition, and one the international.

9. A clear distinction should be made between the representation of features known to have been surveyed with sufficient accuracy to render any subsequent important alteration improbable, and the representation of those features which have been imperfectly surveyed or only roughly explored."

In pursuance of a proposal brought forward at one of the meetings of Section I. by General de Schokalsky for the formation of an International Cartographic Association (such as had already been proposed at previous congresses), the President of the Congress, at the request of that section, nominated a committee to consider that proposal, as well as one laid before the same sectional meeting by M. Schrader for showing in a simple and distinct manner the progress of exploration over the world in the manner indicated by him in a *répertoire graphique* exhibited by him. This committee recommended (1) that the proposal of M. Schrader should be adopted; (2) that the committee should be continued as a permanent committee of the Congress, with authority to take steps towards the publication of such a *répertoire*; and (3) that the action proposed by this committee, taken in conjunction with that of the committee of the map of the world on the scale of 1:1,000,000, should be considered as constituting the first and most practical step towards carrying out the work of the International Cartographic Association.

In the event of these propositions being adopted by the Congress, the committee proposed to proceed as follows:—

(a) To prepare a plan for the general publication of the *répertoire graphique*; to draw up an estimate of the cost of publication of successive editions of the *répertoire* under the responsibility of several map publishers, and thus to ascertain the price at which it could be delivered to subscribers.

(b) To invite the principal geographical societies to publish in their *Journal* a specimen sheet, chosen by the committee, of the *répertoire* as prepared by M. Schrader, with the addition of an explanatory text prepared by the committee, and a statement of the conditions on which the *répertoire* might be supplied to subscribers.

(c) To proceed with the publication of the *répertoire* if, in the opinion of the committee, the subscriptions were sufficiently numerous to warrant the enterprise.

(d) To bring about collaboration with the view of keeping the *répertoire* up to date.

On the proposal of Commander Roncagli, delegate of the Italian Geographical Society, authority was given to the presidency of the Congress to appoint an international committee to study in a systematic manner a project for the establishment of an International Bureau to answer geographical inquiries in the interests of commerce.

The Congress also adopted the resolution brought forward by M. H. Arctowski, that it desired to place on record its sense of the importance of completing forthwith the systematic exploration of the polar areas, and of utilizing the experience gained in recent Antarctic expeditions by following up without delay the success that has been achieved.

Finally, the Congress recommended that geographical societies should seek to interest their respective governments in the reproduction of the cartographic remains of antiquity, the Middle Ages, and the Renaissance, and nominated a committee consisting of Prof. O. Nordenskiöld, Mr. K. Miller, M. G. Marcel, Prof. Oberhummer, and C. Perron, to promote the carrying into effect of this desire, and to present to the next Congress a catalogue showing what ancient maps have been reproduced in facsimile, and indicating in order of importance the old cartographic material which it was particularly desirable to have reproduced.

As usual, various excursions were organized in connection with the Congress, and an admirable handbook of excursions was drawn up.

In his opening address to the Congress, the President of the Swiss Confederation, while stating that the members were not to expect the sumptuous receptions which they had had in some of the great cities of the world in which previous congresses were held, gave the members the assurance of very cordial hospitality on the part of the city and people of Geneva. This modest assurance was amply justified. Everything

was done to make the stay of the members in the city agreeable. The crowning act of hospitality was a steamboat excursion on the Lake of Geneva on the fourth day of the meeting, an excursion that was favoured with ideally propitious weather.

Invitations were given by several towns for the next meeting of the Congress, but only two entered into serious competition at the meeting of delegates held to consider this point—one from Budapest for the year 1912, the other from Rome for the year 1911. The meeting decided by a majority of votes in favour of Rome.

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## SIXTEENTH INTERNATIONAL CONGRESS OF AMERICANISTS AT VIENNA, SEPTEMBER, 1908.

By Sir CLEMENTS R. MARKHAM, K.C.B., F.R.S.

THE International Americanist Congress met at Vienna from September 8 to 14, with the Archduke Rainer as Patron and eight honorary presidents, of whom her Royal Highness the Princess Theresa of Bavaria, the distinguished South American traveller, was present through all the meetings. The inaugural addresses were delivered in the great hall of the university.

Out of the forty-four papers, the majority were strictly archaeological, ethnological, or linguistic, but there were several of geographical interest. Prof. Franz Ritter von Wieser of Innsbruck described the "mappe-monde" of Pierre Destelier, 1553, the property of Count Wilczek. He also presented the Spanish text, with facsimiles of the maps, of the "Islario General" of Alonso de Santa Cruz, cosmographer of Charles V. It is a valuable and very interesting result of the geographical researches conducted by the emperor's cosmographers. Another ancient map of America, date 1526, was described by Dr. Denucé of Brussels. Miss Adela Breton, who has been occupied for some time at Mexico in copying a very ancient and curious plan of Tenochtitlan, exhibited her careful and admirably executed work at one of the meetings. It excited great interest, and wishes were expressed that it might be made accessible. This curious relic will probably accompany the translation of Bernal Diaz which Mr. Maudsley is editing for the Hakluyt Society, in some form or other. But there is a difficulty in reducing the scale, owing to the loss of interesting details.

Dr. Franz Boas is well known to geographers for his researches in Baffin Land. He gave the congress an account of the results of the Jesup Expeditions in the Alaska regions. An equally important paper, from a geographical point of view, was that on his researches on the coast of Esmeraldas (Ecuador), by Mr. Marshall H. Saville of New

York. The physical aspects characteristic of the coast of Peru terminate near Tumbes, and from the Gulf of Guayaquil northwards across the equator, the conditions being different, the appearance of the coast is changed. This coast of Ecuador, therefore, presents features of special geographical interest, which have never been so well described and illustrated as by Mr. Saville, whose main object was, however, archæological research.

Other papers had some bearing on geography, especially Dr. Preuss's account of Indians in the Sierra Madre of Mexico; Dr. Schmeltz and Jonkheer Panhuys on expeditions in Surinam, Don Manuel Peralta on Central America, and Dr. Thalbitzer of Copenhagen, who had passed a winter with the Eskimo of East Greenland. Prof. Juan B. Ambrosetti, the director of the ethnological museum at Buenos Ayres, came with the results of his very interesting researches in Tucuman; and Prof. Max Uhle arrived from Lima, where he has for some years directed the museum of national history with distinguished ability with communications which were of great interest.

The members of the Congress were entertained on Sunday the 13th by Count Hans Wilczek at his castle of Kreuzenstein, and on Monday there was a reception in the town hall. All the arrangements were good, and this sixteenth meeting of the Congress of Americanists was a decided success.

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## AN UNCONVENTIONAL MAP OF THE WORLD, AND A PLEA FOR ITS USE IN SCHOOLS.

By R. D. OLDHAM.

HAVING occasion, for a purpose unconnected with geography, to construct a map of the world on an arrangement differing from any in ordinary use, and from any map which I was able to procure ready made, the result appeared so instructive and useful for educational purposes that I venture to place it before readers of the *Geographical Journal* in the hope that some enterprising publisher may take up the matter, and prepare a similar map on a larger scale for adoption and use in schools.

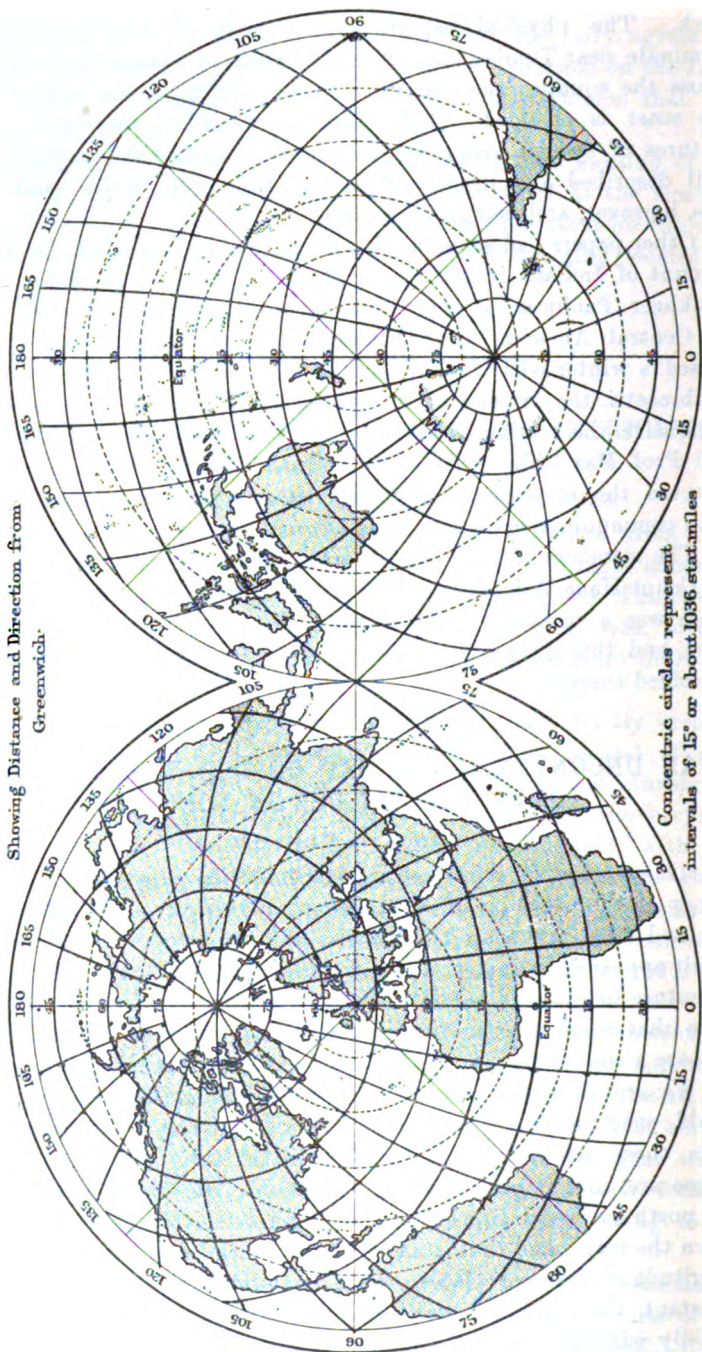
We are all acquainted with the conventional Mercator map of the world, constructed on a projection which has many advantages, apart from those which render its uses almost obligatory in navigation. These are, that it preserves the compass bearings true for every point, the north and south line being always perpendicular, or directly up and down the map; and that it shows at a glance the relative latitude and longitude of different places. Its drawbacks are that the scale is not constant, the size of equal areas on the Earth's surface increasing rapidly with the latitude, and that it gives a most misleading impression of the relative size and position of places not situated on or near the equator. The proper corrective for these defects is a much more

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# THE WORLD

Showing Distance and Direction from  
Greenwich.



Concentric circles represent  
intervals of 15° or about 1036 stat.miles

extended use of the globe in teaching, but, unfortunately, the globe is not adapted for class demonstration, and something in the way of a map is required which will help to correct and complete the deficiencies of the Mercator projection.

At present there is practically nothing but the well-known "world in hemispheres," in which the surface of the globe is arbitrarily divided into an eastern and a western hemisphere. This represents fairly well the disposition of places on the Earth's surface relative to the centres of the maps, but as these centres lie in the open ocean on the equator, and therefore in a place where no one lives, and to which no one wants to go, the arrangement is devoid of that practical application which it would have if the place in which the map was to be used were adopted as a centre. In England we should naturally adopt London, or, what is practically the same, Greenwich, and obtain a map like that which illustrates this paper.

It will be seen that this map is very different in appearance from those to which we are accustomed, and at first sight the shapes of the land areas seem incorrect. Who, for instance, has seen such an America as is here depicted. Yet if it is compared with maps to be found in atlases, and allowance made for the curvature of the meridians and parallels, it will be seen that the distortion is not greater, but merely in a different direction from that to which we are accustomed.

This question of distortion is an interesting one. Some distortion is inevitable in any attempt to represent a part of the surface of the globe on a flat map, and when the whole of a hemisphere is represented, the distortion must necessarily be considerable in some part or other of the map. Whatever may be done within the map, its diameter must always represent the same distance as one-half of the circumference, and in a circular map the ratio of these two lengths is 1 : 1.57—that is to say, there must be a distortion of at least 57 per cent. in some part or other of the map, and the only thing to be decided is the form which this distortion is to take. We may preserve the shape of each small area and vary the scale, or we may keep the scale constant and submit to a distortion of shape. As the object of the map was to show the position of places relative to Greenwich, it naturally became desirable to maintain a constant scale of distance along lines drawn outwards from the centre, and what is known as the zenithal projection was adopted. The general distortion on this projection is less than on any other, with one exception; it is less than 10 per cent. in the central part of the map, up to a distance of two-thirds of the radius from the centre; it increases in the outer part, but only at the extreme edge does it reach that limit of 57 per cent. which cannot be avoided somewhere or other in the map.

Adopting this projection, we get a map on which all points at equal distances from the centre lie on a circle, whose radius is directly

proportional to the distance, and a straight line drawn from any point to the centre represents the direction in which the great circle or line of shortest distance starts. Constructed with London as a centre, for use in England, it seems to correct some common but erroneous impressions. It is seen, for instance, that Jamaica lies nearly due west; that Bombay and Perth, W.A., both lie almost due east, and that the direct and shortest line to Calcutta starts in an east-north-easterly direction; also it shows that when Captain Scott started southwards from the *Discovery* winter quarters towards the pole he was really making a bee-line for home.

Many other curious results come out from a study of the map, some of them more clearly, and certainly more conveniently, than on a globe, and it seems that a map of this kind, side by side with the Mercator map, would make a more useful combination than any at present procurable.

## THE DISTRIBUTION OF POPULATION IN THE UNITED STATES.\*

By Prof. ALBERT PERRY BRIGHAM.

THE United States had, in 1900, a population of about 76,000,000, an allotment on the average of 25·6 persons to each square mile. In an area not greatly larger Europe had at that date 390,000,000 people, giving a density of 101. It is convenient to remember that the density is about four times as great in Europe as in the United States.

Comparing the new country with three of the European peoples, Great Britain, with an area smaller than that of the state of Colorado, had more than 41,000,000 people, and showed a density of 470, while England exhibited a density of 605. Belgium, less than one and a half times as large as the small state of Massachusetts, had a density of 616, ranging from a minimum of 130 in Luxemburg to 1027 in Brabant. The kingdom of Italy is not much larger than the state of Nevada. This state had, in 1900, less than one person per square mile. Italy, in 1901, had 32,000,000 people, and showed an average density of 293, while the province of Lombardy had 456 persons to each square mile. The vast and diversified Dominion of Canada, on the other hand, greater than its southern neighbour, had less than 6,000,000 people, and exhibited a density of about 1·75 to the square mile.

### CENTRE OF POPULATION.

The centre of population in 1900 was in the state of Indiana. In 1790 the centre was 23 miles east of Baltimore, in the state of Maryland, or virtually on the Atlantic shore-line. Its migration has been slow and remarkably uniform, both in rate and in direction. It has hovered for one hundred and ten years along the 39th parallel of latitude, and its total variation in latitude has been less than one-third of one degree. The westward movement has averaged less than a degree in a decade, notwithstanding the incredibly swift occupation of a vacant continent by a movement of population westward. The easterly position of the

\* Read before the Ninth International Geographical Congress, Geneva, July, 1908.

centre of population is in part due to the fact that the eastern part of the continent was first settled, and was settled from the east. The population wave has always been rolling up on the Atlantic lowland, before pushing its crest across the Appalachian highlands. The easterly position of the centre of population is also due to the more evenly distributed and more abundant resources of the eastern half of the United States. It should not be forgotten that the geographical centre of the United States lies some hundreds of miles west of the Mississippi river. The eastern half of the country therefore embraces the Atlantic lowlands, the prairies and Great Lake plains, the Gulf lowlands, and the forests and minerals of the Appalachian mountains and Appalachian plateaux. Over against these are the arid and mountainous areas of the west. Certain areas will be reclaimed to incredible productiveness, and the mineral wealth is vast: but the centre of population may be expected to remain permanently to the eastward of the geographical centre of the land.

#### DENSITY BY DIVISIONS.

The North Atlantic division of the official census includes the six New England states and the middle states except Delaware. It is essentially the group representing the northern colonies of early days. Here the density is 129·8. The South Atlantic division ranges from Delaware to Florida, including thus the old southern colonies and Florida. Here the density falls to 38·9, less than one-third as compared with the most sparse district of Belgium. We may compare the North Atlantic and South Atlantic divisions. The northern climate is classed as temperate, with severe winters. The southern climate is temperate to sub-tropical, but not at any point of latitude is it such as to repress population by excessive heat. The northern division has in the main a glacial soil as against a residual soil in the south. The northern division is largely mountain and plateau, with well-matured and fertile valleys, and the south combines with higher mountains equally rich valleys, and superadds a vast extent of coastal plain in a most hospitable climate. In both north and south are ample rainfall and forests. If the physical advantage lies anywhere, the balance would seem to incline to the south.

From the point of view of physiographical relations, the north has a shorter passage from Europe, which may be viewed as important, especially as the more active colonizing and commercial powers of Europe lie in northern latitudes. The north has better harbours than the south, and, perhaps more important than all else, holds the easier passes of the Appalachians.

Historically, early settlements north and south were nearly contemporaneous in Massachusetts and Virginia, as at other points in both regions. But small holdings, free labour, and varied culture obtained in the north, while the plantation, slave labour, and less varied culture, as of cotton and tobacco, ruled in the south. It remains for the economist and the sociologist to measure the force of these influences in retarding the growth of the south. The geographer, however, is safe in concluding that the larger and facile geographical relationships of the north went far to obscure any local advantages of soil and climate of which the south was possessed.

The north-central division includes the five states north of the Ohio river, also Minnesota, Iowa, and Missouri on the west bank of the Mississippi, and the Dakotas, Nebraska, and Kansas farther west. The density in this division is 34·9. If we omit the four first-named, as extending in part into the arid belt, we shall have a more homogeneous area, and shall find a density of between 50 and 60. If we remember that this is the most fertile great area in the United States, we may observe with surprise that the density is less than half that of the North

Atlantic division. The explanation is had in the fact that it is much younger and that it is mainly agricultural. It has its great population centres, as Chicago, but it has not yet so fully reached the manufacturing and commercial stage of evolution as has the North Atlantic division, with its innumerable mills, factories, and town centres, and the intensive agriculture that accompanies urban population.

On the other hand, the north-central division has larger density than the much older South Atlantic. This is due to its intimate ancestral relation to the east, to its ample commercial relations with the Atlantic seaboard, to the richness of its soils, and to a more favourable industrial and social system.

The South Central Division includes the States between the Ohio river and the Gulf, and westward to Oklahoma and Texas. Here the density is 23·1. This figure is low, and yet Kentucky, Tennessee and Arkansas are as rich in soil and mineral wealth as the North Atlantic division, while Oklahoma and the Gulf states as a whole are abounding in soil, climate, in forests and mineral wealth. The only material exception is the interior of the Texas, where large areas belong to the arid and mountain regions. We must take account here, however, of the repressive influence of slavery, of the comparative inaccessibility of the interior states of this group, and of the remoteness from Europe of the Gulf coast. Already, however, these repressive conditions are losing their force, through the change of social conditions, the recognition of natural wealth, the improvement of the great waterways of the Mississippi and Ohio, through the extension of railway systems, the building of highways and the general evolution of industry.

The Western division includes the Cordilleran region from the western edge of the great plains in Colorado and Wyoming to the Pacific coast. The density is 3·5, and the explanation of the sparseness is close at hand. It is a region of recent occupation, of vast areas of aridity, of extensive mountain surfaces, and much of it even yet is comparatively inaccessible. It awaits the fuller work of irrigation through private and federal enterprise, the further exploitation of its coal and its precious metals, the regulation of railway traffic and the opening of the Isthmian canal, with increase of commercial life for the great states lying on the Pacific shore line. This enlargement may be expected to follow not only upon easier communication with the east, but in perhaps large measure, may be due to relations with Alaska and the Orient.

#### EXTREMES OF DENSITY.

The greatest density exhibited by any state as a whole, is found in Rhode Island, where the figure is 407. Even in this small state the population is locally concentrated, and a recent writer has shown that but 6 per cent. of the people live west of a north and south line bisecting the state. This western half of the area is more and more given up to the forest.

Massachusetts is next in the scale, having a density of 348·9; New Jersey follows with 250·3, and Connecticut is fourth, with 187·5. These densities in no sense represent the capacity of the soil, but are due to concentration in commercial and manufacturing towns. A large part of Massachusetts is occupied by the mountainous region of the Berkshires, with few people. On the other hand the Connecticut valley and much of the coastal lowland are crowded with towns and with small and intensively cultivated farms. The same is true of the uplands and the Connecticut valley, in the state bearing that name. In New Jersey, we find the density hingeing entirely upon the proximity of two great cities, New York and Philadelphia, lying beyond the bounds of the state. Much of her territory is mountain upland, and sparsely peopled coastal plain.\*

\* Paper by R. H. Whitbeck, read before the Association of American Geographers, Chicago, 1907.

The small densities appear in the western division. This region has more than twelve times the area of the United Kingdom, and bears a population less by 1,000,000 or more than the single city of London. The range is from a fraction of one person, as in Nevada, to about ten, in California. Only one state east of the Mississippi river fell below a density of ten in the year 1900. This state was Florida.

#### RURAL DENSITY.

If we omit all centres having a population of 4000 or more, we shall have remaining the agricultural population, and the villages and hamlets whose industries are essentially a part of the rural life. We may here distinguish what we may call the *rural density*, and thus may gain a rude measure of the extent to which the soil itself is occupied. The total density and the rural density for the several divisions are thrown here in tabular form.

	Total density.	Rural density.
North Atlantic division ... ..	129.8	43.3
South Atlantic division ... ..	38.9	31.2
North Central division ... ..	34.9	22.5
"Nebraska, and "Kansas" (omitting the Dakotas, }	—	34.1
South Central division ... ..	23.1	—
(excluding Texas) ... ..	—	27.5
Western division " ... ..	3.5	2.4

It thus appears that the country east of the arid belt shows rural densities ranging from 27.5 to 43.3. If we now remember that the North Atlantic division has a large number of manufacturing villages with populations falling under 4000, we see that the rural density is more uniform than the figures indicate. This is yet more clearly shown under the following heading.

#### DENSITY OF AGRICULTURAL WORKERS.

The United States census for 1900 enables us to exhibit the number of actual agricultural workers for the whole country and its several divisions. The table shows the number for each square mile and the consequent number of acres which receive the labour of one man. The arid belt and all states to the west of it are omitted except in the first item.

	Number of workers per square mile.	Acres each worker.
Whole country ... ..	3.5	182.0
North Atlantic division ... ..	6.6	97.0
South Atlantic division ... ..	7.5	85.3
North Central division (omitting five states as above) ... ..	6.4	100.0
South Central division ... ..	7.6	84.4

Averaging, it appears that within the region of sufficient rainfall, we find seven agricultural workers for each square mile, or one worker for each 91.4 acres. The

uniformity, or the approach to this average, of each of the great divisions seems worthy of remark. These figures refer not to land in actual tillage, but to the entire land-surface of the several regions.

In each of the divisions except the North Atlantic the acreage under the care of one worker decreased from 1890 to 1900, showing thus a progress toward intensive culture. In the North Atlantic division in that decade the average per man increased from 94.4 to 97 acres. This was no doubt due to the passage of farms or fields into pasture and forest. The real movement in that region, as in the others, is toward intensive farming.

#### SPECIAL AREAS OF SURFACE AND SOIL.

Two examples are taken from the state of New York. The table gives the density and the rural density of four selected counties.

	Density.	Rural density.
Hamilton ... ..	2.8	2.8
Chenango ... ..	43.2	35.4
Delaware ... ..	30.3	30.3
Orleans ... ..	76.1	5.3

Hamilton county is wholly mountainous, and nearly all bears forest, being part of the pre-Cambrian Adirondack region. There are no villages worthy of mention, and the two densities are the same. It is a different world from the Palæozoic lands to be found within 50 miles in any direction.

Chenango and Delaware counties belong to the Devonian uplands of the Appalachian plateau, and to that section locally known as the Catskills, and their extension westward. Altitudes of 1500 and 2000 feet prevail, except in the deeper valleys. The chief industry is the dairy, and the towns are small, so that the two densities are equal in Delaware and similar in Chenango.

Orleans county belongs to the lake-plains of the Iroquois region; its surfaces are chiefly level, its soils rich, and its climate ameliorated by the great reservoirs of lake-water. Cereals and fruits rule; the county contains thriving towns, but no cities; and the rural density rises to 53.

The next example relates to surface as well as soil, and has primarily to do with communication. We may well define a *transportation belt* in New York, namely, the counties lying along the New York Central and Hudson River Railway. This railway passes from the city of New York along the Hudson, westward by the Mohawk pass, and along the lake-plains to the foot of Lake Erie.\* Few American routes are so well known in Europe as this. The counties bordering this line of railway contain about 30 per cent. of the land-surface of the state, and they hold 77 per cent. of its population. They contain all the cities rising above a population of 100,000, namely, New York, Syracuse, Rochester, and Buffalo. The belt, indeed, includes all the cities surpassing the limit of 50,000, with one possible exception. This is the route also of water communication from the lakes to the sea, and it is in itself peculiarly favoured in its lacustrine and alluvial soils, and in its milder winter climates, as compared with the uplands on either hand.

\* "The Eastern Gateway of the United States," A. P. Brigham, *Geographical Journal*, London, vol. 13 (1899).

Similar discriminations, on the basis of physical geography, could be indefinitely multiplied by examples from other states, such as North Carolina, Wisconsin, Kentucky, Missouri, or Alabama.

#### CITIES OF THE FIRST ORDER.

The next analysis will relate to the great cities, and must be in outline, for any adequate treatment would demand a separate paper. We rank as cities of the first order, all having a population of 250,000 or more in the census of 1900. There were sixteen such cities. Washington was one of these, but we omit it from further consideration as having been wholly special in its origin and development.

The remaining fifteen fall into three groups of five each—marine, lacustrine, and fluvial. The marine cities are Boston, New York, Philadelphia, Baltimore, and San Francisco. Two of these are on estuaries and three are on tidal bays, while four are Atlantic ports, and one belongs to the Pacific. In order of population of cities of the first order they stood (1), (3), (5), (6), (8).

The lacustrine cities are Buffalo, Cleveland, Detroit, Chicago, and Milwaukee. Detroit is, indeed, on the short Detroit river, but is no real exception, as it derives its chief importance from its relation to lake traffic. Three of these cities are on or closely related to Lake Erie, and two are on Lake Michigan. There is no great city on the American side of Lake Ontario, the presence of Niagara having forbidden it. And there is no great city on Lake Huron or Lake Superior, although Duluth's importance is not to be measured by its present population. Of Lake Superior it is to be said that it is too far north for domestic trade across the continent, and it is bordered by a rugged region of mineral and forest. The population rank of the lacustrine cities was (2), (7), (8), (13), and (14).

The fluvial cities are Pittsburg, Cincinnati, St. Louis, New Orleans, and Minneapolis-St. Paul. The last is composed of two municipalities, but their situations and their history constitute them essentially a single-river city. New Orleans may be considered as partly marine in its type. Of this group two are on the Ohio river and three on the Mississippi, all belonging to the Mississippi System.

Of the entire fifteen, only one is west of the 93rd meridian, and but three are west of the Mississippi river, two of these being upon its banks. All but one also are in the Atlantic basin.

If we consider cities between 100,000 and 250,000, we find them twenty-one in number in 1900. Of these, four may be regarded as dependencies of great cities—Newark, Jersey City, and Paterson as related to New York, and Alleghany as virtually a part of Pittsburg. Of the remaining seventeen, three are tidal—Providence, Fall river, and New Haven; and six are fluvial—Louisville, Kansas City, Omaha, St. Joseph, Memphis, and Rochester. One of these centres, Scranton, is based on the mining of coal, three are state capitals, Denver, Indianapolis, and Columbus, and one, Toledo, is lacustrine. Indianapolis would now rank as of the first order, and, like Denver, has important relations other than to the government of its state. The three remaining centres, Syracuse, Worcester, and Los Angeles, are inland towns of various origin.

#### CONCENTRATION OF INDUSTRIES.

The building of a great industry in a region, or in a specific centre, modifies in important ways the distribution of population. The United States abounds in illustrations of this principle. Such gatherings arise in relation to natural resources, such as combinations of soil and climate. Indian corn may be termed a prairie product, although widely distributed beyond the prairie region. Hot

summers and wide areas of fertile soil have led to such enormous productions of this crop in Illinois, Iowa, and adjoining lands, that it may fairly be cited as an example of concentration even though other grains are largely grown. The livestock industry follows the corn, though by no means coincident with it, since the natural pastures of the plains reach far beyond the corn belt. The oranges of Florida, or California, the peaches of Niagara, the grapes of Chautauqua, and the fruits and vegetables of the Atlantic coastal plain offer further examples.

The Cordilleran States abound in groups of population centred around a single industry, usually agriculture or mining, and the one is as striking and conspicuous as the other. If the rush of people for gold in California was spectacular and dramatic fifty years ago, the concentrations due to fruit and grains are scarcely of less absorbing interest in the central valley of the San-Joaquin and the Sacramento at the present time. The Willamette valley in Oregon, the plantations of Utah, and the farms about Greeley, in Colorado, afford noble examples of agricultural concentration in a region where deposits of silver and gold are more commonly remembered as explaining the origin of population groups.

Concentration due to mineral resources is well typified by Pittsburg, where, however, facilities for transportation and relation to other important centres must not be forgotten; or we may turn to the Southern Appalachian valley, where coal and iron are the dominant factors, supplemented by agricultural conditions of a high order.

Resources in the form of power have played a most important part, and perhaps our most available illustration is southern New England, where the streams and waterfalls were obviously and instantly available in a time when coal had not been exploited, and when there were no transportation facilities worthy of the name. Water-power determined the industry and the dense populations of that region, even though fuel power now plays so large a part, and other interests enter in to baffle analysis.

Resources of mine and soil must always combine with favourable transportation. Pittsburg has been cited, and Cleveland, Buffalo, and New York, among others, might be studied with the utmost profit in this connection. The products may be of remote origin, as are the iron and the grain in relation to Buffalo, but the concentration is sure, if the site is in the track of inevitable movement, as determined by grades, navigable waters, and by the position of other growing groups of population.

When a great centre has been established in response to such conditions of environment, then the needs of the population enter as a further factor to react on environment, and give colour and character to all surrounding life. Thus the agriculture of New York and New England has been modified, not only by competition from without, but even more profoundly by the needs of New York and Boston. The single requirement of dairy supplies for these cities largely controls the agriculture for a radius of 300 miles. The growth of these cities, the perishable character of the product, and the imperative needs of millions of people, have almost revolutionized the farming of these regions within a single generation.

The distribution of resources of raw material, of power, and transportation routes is fundamental, but the historical order in which they are found and brought to use is also important, because interests once established are conservative, and tend to hold their place. This inertia will be effective until the tendency to a more natural balance becomes overwhelming. Under such impulse we are brought to the—

## MIGRATION OF INDUSTRIES.

The migration of industries, in the course of more perfect adjustment to nature, may or may not involve the movement of the populations engaged. As the centre of wheat and other grains receded from Western New York to Ohio, to Illinois, to the trans-Mississippi prairies and plains, the movement involved a vast transfer of population, because a new country was exploited, and the same movement is now going on toward that possible vaster wheat centre of coming years in the plains of Canada.

Another migration is in progress, viz. that of cotton manufacture, which appears to mean a shifting of occupation rather than of people. So far as New England may be forced to retire from this field she will turn to other toil the hands of her people. So far as the south may avail to carry her own product from the gin to the loom, she will do so by training her own people to new skill. That labour is mobile is indeed shown by the existence of the large French Canadian mill population of New England, but there seems no reason to predict that any considerable body of New England people will, under an industrial impulse, seek the south.

## CAPACITY OF THE UNITED STATES FOR POPULATION.

The data thus reviewed serve to raise this interesting question, although failing to afford foundation for more than general conclusions. In the long run, the number of people which a land can support depends, not only on the kind and amount of soil, but upon all other resources, and upon the economic condition of all the countries with which relations are maintained. The sources of error in such computations are numerous and grave.

It has been estimated that the Mississippi valley could support 250,000,000 as well as it now supports 41,000,000 people.\* Smaller farms, more effectively utilized, would be needed. Prof. A. B. Hart, writing of the future of the Mississippi valley, compares this region with the valleys of the Hoangho and Yang-tse-king, and concludes that the American valley could comfortably maintain 350,000,000 people. There seems room, however, to compare carefully the standards of "comfort" obtaining on the plains of China in the past, and those standards which will prevail in the fertile heart of the United States in future ages. It cannot be a matter of interest for the geographer or the historian to know how many human beings can maintain a bare existence within a given territory. Further comparisons, however, seem to justify Prof. Hart's estimate, and certainly bear out Mr. Justin Winsor's figure of 200,000,000. The Hart estimate gives a density of 282. Remembering that Belgium has 616, we are requiring but 46 per cent. of the resources needed for the present scale of living in Belgium, a country in which the standard of comfort would seem to be reasonably high. We make due allowance also for the waste, arid lands of the Mississippi valley. In forest and mineral riches our valley seems equal to Belgium, and the future will bring its transportation facilities to comparable completeness. We may accept freely the view that the forests of Kentucky, Tennessee, and Georgia are capable of supporting a population as the Black Forest or the Jura.

The island of Java has recently been taken as an example of large capacity for population.† With an area slightly above 50,000 square miles, the island had in

\* Mr. F. A. Ogg, 'World's Work,' vol. 12, October, 1906.

† A. Weikoff, 'Annales de Geographie,' vol. 10, 1901.

1896 a population above 26,000,000, and a density of 518. The island raises its own food, and the writer thinks that 106,000,000 people could here live with ease, and with suitable variety of food. This means a density of 2000. The author works towards the general conclusion that the equatorial belt of 30° in width could safely support 10,000,000,000 people, or seven times the present number of our race. We here again raise the query, whether, if rice enough for subsistence could be grown, other things having exchange value could be produced to provide for the comforts and general advantages of civilized life. And before adopting Java as a criterion for the Mississippi valley, we must observe that rice grows in but a small part of the valley, and that the future people of that region can hardly be expected to make rice their staple food. It would remain, therefore, for the careful student to compare the quantity and nutritive value of the various cereals with those of rice. We should further take into account the annual successions of crops possible to a luxuriant tropical region.

#### ILLINOIS.

As a limited area, and therefore capable of more exact comparison, we may take this great prairie state. It has a land area of 56,000 square miles. Its population in 1900 was nearly 5,000,000, and its density was 86. Again we compare with Belgium, which has an area less than one-fifth as great, a population greater by nearly 2,000,000, and a density sevenfold greater. The density of Belgium would give Illinois nearly 35,000,000 people. The density of Java would give the prairie state 29,000,000, the area not being greatly different. England is not quite as large as Illinois, and has over 30,000,000 people. The density of England would give Illinois nearly 34,000,000.

There is almost no waste land in the state, and the soil is of high quality. It is probable that in food capacity in proportion to its area Illinois surpasses any of the above examples from the older continents. In other resources she excels in coal, nearly two-thirds of her surface being underlaid by beds of this fuel. She can raise timber if she can spare the land, but is deficient in most metallic minerals. She is prospectively as favoured as any land in commercial and transportation facilities, focussing the trade of the transcontinental railways and of the Great Lakes, and to be open soon to the full possibilities of Mississippi and Isthmian navigation. We may thus conclude that this single state can and will enormously increase its population. But it is not safe to prophesy in figures.

#### THE UNITED STATES AND ITS FUTURE POPULATION.

If we exclude the arid and mountainous regions of the West, what remains would appear to have as great an average capacity for population as England. If we take the point of view of soil and topography, it would seem that the poor areas of our Appalachian uplands were amply offset by the meadows and thin pastures of the Pennine range, of the English lakes, and of Devon and Cornwall. England has reclaimed her fens, and we have the probable estimate that as much good land can be reclaimed by drainage east of the Mississippi river as by irrigation to the west of it. As regards abundance of general resources for export, the United States are more favoured than England in coal, iron, petroleum, and copper, while her climatic range puts into her hands maize, tobacco, rice, sugar-cane, cotton, and all sub-tropical fruits.

Let us see our results, on the basis of equality with England, in the population capacity of the eastern United States. We omit the Western division, Texas, Kansas, Nebraska, South Dakota, and North Dakota. It is perhaps surprising

that but little more than two-fifths of our territory remains, although including a full tier of States west of the Mississippi river. With a density equal to that of England, this eastern part would contain 742,000,000 people. It remains for our posterity to see how far these theoretical possibilities become real.

#### SUMMARY ANALYSIS OF FACTORS CONTROLLING DISTRIBUTION.

The present discussion has given sufficient evidence that these factors are many in number, complex in action and difficult of analysis. They are at the same time interesting, because of the wide range and sharp contrasts in the physical conditions, and because of the brief history and swift changes of the United States.

We enumerate (a) soil, rainfall, and temperature, which issue is what we may call *crop-capacity*. Thus, even if no other factor operated, Belgium must, by virtue of these conditions, always have a much greater population than Norway. Massachusetts, as we have seen, has a density of 349, while Illinois, far richer in the produce of the soil, shows but 86. This means that other factors have wrought and still are powerful. A second factor, or group of factors, is (b) the mineral, forest, and power resources, leading to concentration of industries and to corresponding massing of population. A simple case is found in the large towns and cities of the region of anthracite coal in Pennsylvania. The coal lies in a rugged tract which, but for this mineral, must ever have been sparsely peopled. Other examples have been given in the brief account of conditions of concentrations. We name (c) physiographical relations. This factor, as we have seen, goes far to explain the dense populations of the North Atlantic, as compared with South Atlantic states. It is further illustrated by the transportation belt in New York, and by the growth of such centres as Chicago and Denver. Finally, (d) historical and social conditions must never be neglected. However reluctant the geographer may be to step beyond his own sphere, he must reckon with the character of races and the march of events through the centuries. Indeed, we may be assured that the complex adjustment of the human race to our planet will be truly interpreted for the geographer, when the problem has long been studied from the points of view of geography, history, ethnology, political economy, and social science. It would be rash to conclude that the above, or any proposed catalogue of factors influencing distribution, is complete.

In conclusion, the following general deductions seem, to the writer, important and appropriate:—

(1) The distribution of population, casually studied, offers to geographers an important field of research.

(2) The distribution of population, so studied, should have a large place in geographical and historical education.

(3) Such study promotes the scientific organization of geography, because it unfolds a process of progressive adjustment to environment.

(4) A young country, such as the United States, offers opportunity for such investigation, because of its physical variety, its brief history, and the resulting facility with which its changes can be seen and interpreted.

## THE PRESENT AND FUTURE WORK OF THE GEOGRAPHER.\*

By Major E. H. HILLS, C.M.G., R.E.

THE thirty years that have elapsed since the British Association last met in this city of Dublin have seen an obvious and rapid progress in the science of geography, and a steady, though perhaps not quite so apparent a change in the character of that science.

In 1878 large parts of the Earth's surface still remained untrodden by the feet of a white man; large areas were open to the enterprise and intrepidity of the explorer; large spaces were blank paper upon our maps. Now there is but little of the Earth's surface absolutely unknown.

It is not my intention to detain you by any recapitulation of the work of these years to show you how and by whom these areas have been traversed and the gaps in our maps filled in. I intend rather to speak of the present and of the future work of the geographer, and to do this to any advantage we must at the outset recognize the change that has taken place in the nature of his task, and the fact that the days of individual exploration are over, never to return. We must recognize that sporadic, unorganized effort must be and is being replaced by organized, systematic work, and that the scientific traveller of the last century, with his rough map-making equipment, his compass, watch, and sextant, has yielded his place to the scientifically equipped survey party, with their steel tapes, theodolites, and plane-tables.

The theme is not a new one to this section. I find, on referring to the transactions of past years, that in 1902, at the Belfast meeting, Sir Thomas Holdich, the President of Section E, said, "We find those spaces within which pioneer exploration can be usefully carried out to be so rapidly contracting year by year as to force upon our attention the necessity for adapting our methods for a progressive system of worldwide map-making, not only to the requirements of abstract science, but to the utilitarian demands of commercial and political enterprise."

The words express succinctly the ideas that I wish to take as the text of my address to-day. I am, however, not ambitious enough to attempt to cover the whole surface of the Earth in the brief review that I intend to put before you of the progress of scientific survey. Rather I wish to restrict our outlook to that section of the work in which we may all be considered as having a direct personal interest, namely, the survey of the British Empire, especially those lands under the more immediate tutelage of the Government of this country. Let it not be thought, however, that while we for the moment pay little attention to the regions lying outside this definition, we are supporting the fallacious idea that the survey of any part of the Earth can be considered apart from the survey of the surrounding country. With the possible exception of the case of an oceanic island, such an assumption would be an erroneous one. Our British empire is so widespread and our possessions are so often in close and intricate juxtaposition with those of other nations that there is in this work large scope, and indeed necessity, for international co-operation. Examples of this will occur to us in the course of our review. We shall thus see that in addition to the obvious connection which the geography of our empire has with that of other countries there is an

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even closer connection in the methods of manufacture of that geography, which methods we summarize under the general term of survey. One of the root ambitions of the scientific surveyor is to determine the exact figure of the Earth, an operation for which observations spreading over a large area of the Earth's surface are demanded. In fact, we may truly say that the problem of the Earth's shape will not be completely solved until the whole surface is known to the surveyor. This is, therefore, pre-eminently a problem for international solution.

Before proceeding to the consideration of our special subject, the survey of the British empire, it will be interesting to interpose a few remarks on the questions of the utility and origin of national surveys in general. We may first note the somewhat curious fact that the production of a map of a country, useful as such a work is for many purposes, has almost always been embarked upon because the imperative necessity of maps of the theatre of operations in war has been brought home to the people and Government of a nation. Thus the ordnance survey of England had its first beginning in a military map of the highlands of Scotland, commenced in 1747, intended to facilitate the operations of the troops under the command of the Duke of Cumberland. It was not till many years later that the systematic triangulation of the country was undertaken, a work which was initiated partly for map making and partly for astronomical purposes. There was a consensus of opinion among astronomers that it would be greatly to the advantage of that science if the observatories of Greenwich and Paris could be connected by triangulation, and the famous French astronomer Cassini, in October, 1783, drew up a memoir to this effect. The arguments brought forward convinced King George III., and he granted a sum of money sufficient to enable the work to be started. This act of royal generosity was recorded by the surveyors in the following grateful terms: "A generous and beneficent monarch, whose knowledge and love of the sciences are sufficiently evidenced by the protection which he constantly affords them and under whose auspices they are daily seen to flourish, soon supplied the funds that were judged necessary. What his majesty has been pleased to give so liberally it is our duty to manage with frugality consistent with the best possible execution of the business to be done."

It is worthy of remark that the junction of the triangulation systems of Great Britain and France was not made until 1861, and that the trigonometrical connection of Greenwich and Paris observatories has not yet been completed to the final satisfaction of men of science—a point which we shall have occasion to recur to later.

In France, we may note in passing, the starting of the triangulation had a quite different and quite definite object, the determination of the length of the metre. This unscientific unit of length was fixed as a fraction ( $1:10,000,000$ ) of the quadrant of the Earth's surface between the pole and the equator, and to find this quantity it was necessary to measure on the Earth's surface as long an arc of the meridian as could be obtained.

In the case of our other great national survey, that of India, its origin is to be found in circumstances somewhat analogous. The Madras Government, owing to the success of the British arms in the Mysore campaign, found itself with a great accession of totally unsurveyed country in the middle of the peninsula, while at the same time there were only in existence the roughest sketch-maps of the older possessions. It was apparent that if any map, of even approximate accuracy, was to be made covering a country of such vast area, it was imperative that the work should be prosecuted upon the most rigorous and strictly scientific basis. The general lines upon which it should be undertaken were laid down in February, 1800, by Brigade-Major Lambton, who addressed a letter to

the Madras Government advocating a mathematical and geographical survey of the Peninsula.

In this letter he discussed the principles upon which such a survey should be based. He dismissed astronomical fixations as not providing the requisite degree of precision, observing that such determinations of position are liable to great inaccuracies, "three, four, perhaps ten minutes," and proposed a triangulation emanating from a measured base line checked by similar base lines at intervals. He recognized that the figure of the Earth and lengths of the polar and equatorial radii were not then known with the precision necessary for fixing the spheroidal co-ordinates of the trigonometrical stations of a survey covering such a large area of the Earth's surface, and that a geodetic survey was therefore necessary *pari passu* with the geographical survey. He had an impression, how derived it is not now possible to say, that there was a sudden abnormal diminution of the force of gravity at the latitude of  $10^{\circ}$  N., and consequently that "a degree on the meridian from that parallel to the Equator must be very short compared with a degree to the northward of  $10^{\circ}$ ." He observed that it would be necessary to "attend to this circumstance," which he characterized as important both from the map-making and from the rigorously scientific point of view. He added, "I shall rejoice, indeed, if it should come within my province to make observations tending to elucidate so sublime a subject."

In a similar case, occurring in recent years, the outcome has not been so satisfactory. It will be within the recollection of all here how at the time of the South African war the public at home learnt with shocked surprise that there were no maps in existence of a colony which had been under the British flag for a long period of years. To those who knew the facts this was, naturally, no matter of surprise; but it was earnestly hoped by many that this grave deficiency thus revealed by the stress of war would be remedied by quiet work in the time of peace, and that, at the conclusion of the military operations, the foundation should be laid for a federal survey department of British South Africa comparable with, though on a more moderate scale than, the Survey Department of India. This hopeful scheme, which it may be recorded very nearly came to fruition, ultimately found political conditions too adverse, and had to be indefinitely postponed. An army engaged in field operations in the north of Natal now, or in fact at any time for an indefinite number of years in the future, would find the country nearly as mapless as it was found by Sir R. Buller in 1900.

In this short recital of the determining causes which have in the past led to the initiation of national surveys, it will have been noticed that no allusion has been made to what we should now perhaps consider the main utility of a map—namely, its value for all purposes connected with the ownership, development, and taxation of land. When the ordnance surveys of Great Britain and Ireland were originated there was little thought of this use, and it was not till long after that period, when the enormous deficiencies of the existing property plans were revealed by the Tithe Commutation Act and by the railway boom, that the value of a national survey for preparing a cadastral or large-scale property map of the country was recognized and acted upon. Now this is often the ostensible object for embarking upon a regular survey. It is fully recognized that, especially in the case of a country undergoing rapid development, which is fortunately true of many of our oversea possessions, the provision of an accurate land map is of prime necessity both to the private or corporate landowner and to the State.

Neither were any of the early surveys undertaken for the purpose of mutual delimitation of international boundaries; a necessity which has in recent years been the stimulating cause for many pieces of valuable survey work, especially in Africa.

The other manifold uses of a map are familiar to all of you and we need not pause to enumerate them. We may admit the fact that the adequate mapping of its territories is recognized as one of the duties of a civilized State. Let me now turn to the main subject of this address—the inquiry as to how far this duty is performed by us, what shortcomings we can perceive, and what suggestions we can offer for the future.

Two years ago this task would have been a difficult and laborious one. Now it is greatly facilitated by the issue from the Colonial Office of those excellent little volumes, the reports of the Colonial Survey Committee.

This body has been in existence since August, 1905, and has published three annual reports. The Committee is therein defined as an advisory one formed at the instance of the Secretary of State for the Colonies to advise him in matters affecting the survey and exploration of British colonies and protectorates, more especially those in tropical Africa. It is not at present an executive body, that is to say it has at its own disposal no grant of public money or other funds; whether it will ultimately develop into such is a question that the future alone can answer. Even thus limited in scope and powers it has, however, already worked a notable improvement—firstly, by laying down authoritatively some of the more salient conditions that ensure the efficient and economical expenditure of whatever funds may be available, and by pointing out the disastrous extravagance of unsystematic and unmethodical work; secondly, by insisting upon uniformity where uniformity is essential, such as in matters relating to the style, projection, scales and sheet-lines of the maps produced, while leaving the utmost latitude as to methods, these being selected in each case to suit the very divergent nature of the country met with. It results from this that any two small portions of the map of Africa, say, for instance, one sheet of the dense forest region of the Gold Coast and another of highland country of East Africa, though 3000 miles apart and executed at different times by a different staff, will match each other in general character, and will ultimately be found to fit exactly into their places as constituent parts of a great map of the country. Thirdly, we may reckon the mere fact of publicity in these matters as of no mean advantage. Though, as in the case of many other Government publications, this report is not as widely read as its merits deserve, yet it is all to the good that the information is there ready and available for anybody who has the curiosity to consult it. I, therefore, welcome the opportunity of drawing your attention to this volume.

In entering upon the discussion on the survey of British Africa, the first point that meets us is the geodetic basis of the whole work; upon what do the actual positions depend? In other words, to put the matter more familiarly, how are we to provide that every isolated piece of the map will exactly fit into its proper place? The only method for ensuring this is by basing all our surveys ultimately upon a skeleton or framework of geodetic or primary triangulation executed with the utmost attainable precision. Such a skeleton, or rather backbone, will eventually exist in Africa in the shape of the meridional arc, or chain of triangles, along the thirtieth meridian, running right through the country from north to south, and ultimately joining on to the great arc observed by the famous astronomer Struve. This originally extended from the mouth of the Danube to Hammerfest, in Norway, an amplitude of  $25\frac{1}{2}^{\circ}$  of latitude. To prolong it southward, passing up the Nile valley, through the heart of tropical Africa, across the Zambezi river, and terminate it at the southernmost point of the continent is a magnificent conception due to Sir David Gill, to whose energy and enterprise the actual execution of considerable sections of the undertaking must also be ascribed.

At the present time the chain has been completed from the south to within 70 miles of the southern end of Lake Tanganyika, a distance of about 1700 miles. At Lake Tanganyika it will enter Germany territory. The German Government, fully recognizing that the project is not only of great theoretical interest, but also of immediate practical value, are already taking steps to start work on their own section, from the south of Tanganyika up to the parallel of  $1^{\circ}$  S. lat. From  $1^{\circ}$  S., northward to about  $1\frac{1}{2}^{\circ}$  N. the arc lies near the boundary between the Congo Free State and the British Protectorate of Uganda. An International Commission is at present engaged in the survey of the boundary region, and Sir D. Gill, ever ready to seize an opportunity of forwarding the work he has at heart, succeeded in raising sufficient funds, partly from the Treasury and partly by grants from a few leading scientific societies, to enable an observer to be sent out with this Commission to carry the arc over this section. North of this point the line comes into the territory of the British Sudan, and traversing this eventually reaches Egypt proper. Here it comes into the charge of Captain H. G. Lyons, the director of the Survey Department of Egypt, under whose care its interests are safe.

It will thus be seen that while the actual completion of the whole chain is as yet somewhat remote, we are in the satisfactory position of being able to say that, as far as the section lying on the continent of Africa is concerned, there is no portion of which there is no reasonable probability that it will be finished within a measurable period. With regard to the section joining Africa and Europe the position is not so happy. This will run through Palestine and Asia Minor, and therefore lies in Turkish territory. It is not likely that the Turkish authorities either will or could carry out such a work; in fact, seeing that even when completed it would be totally useless to them, it would be hardly reasonable to expect them to do so. It must, therefore, presumably be a matter for international co-operation. One point may be mentioned with regard to the exact route of this connecting section. Sir D. Gill, in his Report on Geodetic Survey of South Africa, 1896, said—"By an additional chain of triangles from Egypt along the coast of the Levant, and through the islands of Greece, the African arc might be connected by direct triangulation with the existing triangulation of Greece, and the latter is already connected with Struve's great arc of meridian which terminates at the North Cape in latitude  $71^{\circ}$  N. The whole arc would then have an amplitude of  $105^{\circ}$ ." This, however, gives rather a poor connection with the European triangulation. The South Albanian series has a much higher average error than either Struve's original work or any part of the African series. This portion would consequently be a weak link in the geodetic chain, and it would be better to avoid it altogether by carrying the line along the coast of Asia Minor to Constantinople, and then up the east side of Turkey to the mouth of the Danube.

When we look back a few years and call to mind the prominent part that this country has taken in the survey of Palestine—I need only mention in this connection the names of Kitchener, Warren, and Conder—we cannot avoid a feeling of regret that we are not ourselves in a position to take the whole execution of this section of the line upon our shoulders. I am too well aware of the many urgent claims upon the Treasury to suggest that it is possible that they would be prepared to incur such a charge; but supposing, for the moment, that part of the necessary funds could be provided from other sources, I think we may fairly urge that it is our duty to contribute a substantial monetary grant towards the furtherance of an end so desirable and so practically useful.

The difficulty of obtaining money for geodetic work, the benefit of which is not immediately apparent to the man in the street, is notorious. Thus Sir T. Holdich,

in 1902, said, "But this accurate framework, this rigorously exact line of precise values which ultimately becomes the backbone of an otherwise invertebrate survey anatomy, is painfully slow in its progress and is usually haunted by the bogey of finance. It does not appeal to the imagination like an Antarctic expedition, although it may lead to far more solid results, and it generally has to sue *in formâ pauperis* to Government for its support." To account for this regrettable, but undoubtedly true fact two reasons may be adduced. There is, in the first place, the possible ignorance as to the ultimate value of the work; but, secondly, and perhaps not least, there is the fear, not entirely unjustified, that to satisfy the demands of the scientific man is something akin to the operation of filling a sieve with water. It has been so often seen that compliance with one demand only leads to another being made, that we may well sympathize with the holder of the public purse when he draws the strings tight and refuses to pay for an arc along the thirtieth meridian in the fear that directly this is completed he will be asked to pay for one along the twentieth meridian, and then along the tenth, and so *ad infinitum*. It behoves us, therefore, as practical men to make sure that our demands are reasonable and limited to the actual requirements of the case, and where such limits cannot be set we should make this fact clear at the outset. When, however, it is possible to set such limits, we should not hesitate to do so; and in the case of the African arc this latter course is fortunately possible.

If we take the map of Africa we shall see that the arc along the thirtieth meridian passes through, or near, all the colonies of British South Africa, close to British Central Africa, or Nyasaland, through Uganda, and is thus connected with British East Africa, through the British Sudan and through Egypt. There remain absolutely untouched by it only the West African colonies—Nigeria, the Gold Coast, Sierra Leone, and the Gambia. These latter will eventually get their geodetic framework by an extension southwards of the French triangulation of Algeria, a work of a high order of precision. We are therefore entitled to say—and I take this opportunity of saying it with all due emphasis—that with the exception of some triangulation to join the West African Colonies with the French triangulation, the arc along the thirtieth meridian is the only primary triangulation required for the adequate mapping of the whole of British Africa. The remainder of the geodetic framework can be supplied by ribs of secondary triangulation branching out from the main backbone, (such as the line already completed along the boundary between British and German East Africa, passing to the north of the Victoria Nyanza, and thence westward to the thirtieth meridian.

You will observe that I here speak only of the triangulation required for mapping purposes, not of that demanded by the geodesist for the study of the figure of the Earth. The latter is satisfied only with a survey of the highest attainable precision covering as large an area of the Earth's surface as possible, or at all events with arcs, both meridional and longitudinal, at frequent intervals. It cannot be other than a very long period before the whole of Africa is surveyed upon this scale of accuracy, and in the mean time we must devote ourselves to the far more urgent duty of mapping the country, leaving the more remote and abstract task to our descendants, well satisfied if in our hands the foundations have been well and truly laid.

Furthermore, as we shall see presently, if we are prepared to recognize as a national duty the minutely precise survey of our own land and of all territories under our flag—and I do not see how any reasonable man can withhold this recognition—then there are duties of this nature lying closer to our hands than any to be found in Africa.

Having thus passed in brief review the ultimate geodetic basis of our African surveys, let us enter more into detail and glance at the actual survey work now in progress in the different regions of the continent.

In British South Africa, as we have already noted, the political conditions are at present unfavourable to any comprehensive scheme of operations. There is, however, in progress a first-class topographical survey of the Orange River Colony and a reconnaissance survey of Cape Colony. The former is an excellent example of the class of work that can be done by a small military party of the highest technical training working upon systematic lines, and I should like to devote a few minutes to a short description of the methods adopted and of the results obtained.

The survey party consists of two Royal Engineer officers and four non-commissioned officers, the former undertaking the triangulation and the general supervision of the field work, and the latter the plane-tableing. The positions are primarily based upon the points of the geodetic survey broken up into a secondary triangulation with sides averaging 10 miles. In 1907 the average triangular error of the secondary work was 2.9 seconds of arc, and the greatest linear errors of displacement, as tested by the geodetic triangulation at the end of a chain 45 miles long, were 3 feet in latitude and 2 feet in longitude. The probable error of a trigonometrical height was under one foot. You will see, therefore, that the accuracy is ample for all mapping purposes, even upon large scales, and the degree of precision is in excess of that demanded for a topographical map on the scale of 2 miles to one inch. The rate of progress and the low cost of work are, however, no less notable than its accuracy. The actual rate of out-turn is about 8 square miles per day per man, or for the whole party 23 square miles of detail survey per diem, and the number of trigonometrical points fixed about three hundred per annum. The cost works out to about 8s. per square mile of the completed map, and the whole area of 47,000 square miles will be finished, printed and published in five and a half years.

These remarkable results are due in a large measure to the energy and organizing power of the officer in charge, Captain L. C. Jackson, R.E. The detail survey is done in sheets fifteen minutes square, each non-commissioned officer being given one complete sheet, which he works at until finished. Four such sheets are therefore in progress at any given time, and each sheet takes about six weeks. Seeing the rapid rate of progress maintained it might perhaps be thought that the country is a particularly easy one for the topographer. Such is, however, by no means the case. It is true that there is an entire absence of the surveyor's greatest impediment, large areas of dense forest, but there is much broken and difficult country, rising in places to altitudes of above 7000 feet.

In Cape Colony the reconnaissance survey is of a somewhat similar character, but owing to the large area of the country and to the small amount of money available the work has perforce to be of a more rapid nature. In Natal, Bechuanaland and Rhodesia no survey is at present in progress.

Passing northward through Africa, we come to the British Protectorate of Nyasaland, formerly called British Central Africa. Of this country a certain number of maps exist purporting to give topographical detail; but as they are not based upon any framework of triangulation, and as much of the detail only depends upon rough sketches, it is impossible to say how far they can be accepted as correct representations of the ground.

It is most unfortunate that financial considerations prevent the execution of any systematic trigonometrical survey. The absence of such, and the fact that maps are being made which must inevitably be withdrawn and replaced by others in the future, will undoubtedly be the cause of ultimate waste of money.

Passing northward again we come to the large and important protectorates of British East Africa and Uganda, in both of which systematic surveys are in hand. The geodetic framework is supplied by a triangulation along the Anglo-German boundary, connected with chains of triangles along the railway in the neighbourhood of Nairobi. In Uganda proper there is also a triangulation covering a substantial area. As already noted, all this work will eventually be tied into the thirtieth meridional arc, though it is not likely that the final adjustment of geodetic positions thus arrived at will necessitate any substantial alterations upon the maps.

In both protectorates topographical surveys are in hand, and maps on the scale of 2 miles to an inch will be issued. In British East Africa, under the able direction of Major G. E. Smith, R.E., rapid progress is being made. This topographical mapping is additional to the cadastral maps also in progress in both countries. These latter are required for property purposes, in Uganda for demarcating the estates given over to the native inhabitants of the country under the agreement of 1900, and in East Africa for attachment to title-deeds of lands alienated for farming or stock-raising.

In the Sudan the enormous area of the country—over 1 million square miles—and the limited funds available have prevented any systematic survey being taken up. A large amount of reconnaissance mapping has been done, and a series of sheets on the scale of 1/250,000 (4 miles to an inch) have been published. These are corrected and improved by officers and Government officials as opportunity offers. The energies of the Survey Department are almost entirely spent in meeting urgent local requirements in the shape of cadastral maps of the cultivated areas along the river.

Somaliland, a British protectorate, which came into unfortunate prominence a few years ago, is a country of too small value to be worth the cost of any sort of survey, and the only maps that exist are based upon the route sketches of travellers and sportsmen and upon the work done by a small section of the Survey Department of India during the military operations five years ago.

Leaving the east side of Africa and turning our eyes westward, we may note that in the colony of the Gold Coast a rigorous survey was rendered imperative by the gold-mining boom of 1901. The work was entrusted to Lieut.-Colonel Watherston, C.M.G., R.E. Owing to the dense forest covering practically the whole country triangulation would have been prohibitive in price and very slow in execution. The initial positions were therefore fixed by a network of long traverses, executed with all possible refinements with steel tapes and theodolites. Astronomical latitudes were observed by Talcott's method at every 50 miles. The errors of misclosure of the traverses proved to vary from about 1 in 2000 in unfavourable cases to nearly 1 in 6000—results inferior to triangulation, but at the same time sufficiently accurate to form the basis of a map with no appreciable errors on the paper. One great defect of the traverse method of fixing points lies in the practical impossibility of carrying the heights through without occasional checking, either by lines of levels or by trigonometrical observations. Such work makes therefore an imperfect basis for topography, and would only be used when natural features compel its adoption.

Northern Nigeria is a country of enormous area, and, up to the present, of small revenue. It has therefore not been found possible to allocate the funds for any systematic mapping. The existing maps are compilations based upon sketches made by civil and military officers when travelling upon duty and upon the surveys made by the different Anglo-French and Anglo-German boundary commissions. In 1905-6 Captain R. Ommaney, R.E., fixed the astronomical longitudes

of fifteen towns by exchange of telegraphic signals with Lagos. With the aid of these values, combined with a number of astronomical latitudes, it has been possible to combine the material into something like a complete map. It need, however, hardly be pointed out that astronomical fixations are liable to large and uncertain errors, due to the variation of local attraction, and cannot attain the precision of even a rapid triangulation. In Southern Nigeria the experience has been somewhat unfortunate. This colony has spent a very substantial sum upon its survey department, and if the work had been properly organized and systematically carried out we should by now be in possession of a complete map of a large portion of the country. Unluckily, the mistake has been made of detaching survey parties for non-geographical purposes, such as the erection of telegraph lines, work doubtless urgently required in the interests of the colony, but not lying within the sphere of a survey department. Thus systematic progress was rendered impossible, and, though isolated pieces of triangulation and long lengths of traverses have been done, no topographical map of any area yet exists.

Of the remaining West African colonies the Gambia river is a narrow piece of land with boundaries running parallel to the river banks, and, except for the actual trade along the river, is unimportant. In Sierra Leone the country in the immediate vicinity of Freetown was surveyed by the colonial survey section, a small party employed by the War Office for the purpose of making surveys of places of special military importance. The map of the remainder of the colony is a compilation based on miscellaneous material.

In the course of this summary of the state of the mapping of British Africa mention has been made of the surveys made by joint commissions appointed for the delimitation of international frontiers. No small part of the existing map is due to work of this class. Thus joint Anglo-French commissions have marked out the frontiers of the Gambia, Sierra Leone, the Gold Coast and Nigeria; Anglo-German commissions the eastern boundary of Nigeria, the boundaries between British and German East Africa, between German East Africa and North-East Rhodesia from Lake Nyasa to Tanganyika, and between Bechuanaland and German South-West Africa; Anglo-Portuguese commissions the frontiers between Portuguese East Africa and North-East Rhodesia and Nyasaland respectively. Useful surveys have also been made in the course of the mutual demarcation of the frontiers between Abyssinia and the Sudan on the west and British East Africa on the south; also of the frontier between the colony of Sierra Leone and the Republic of Liberia.

Important as the work done by these commissions has been, its value would be greatly enhanced if the report of each commission were published in a succinct and easily accessible form. Such reports would naturally contain a record of the actual frontier as finally ratified, and also a technical account of the survey methods employed. They would thus be of permanent use both to the official or officer on the spot for the easy settlement of any disputes that may arise, and to the chief of any future boundary commission as an aid to the selection of the methods of survey most suitable to the particular country with which he is concerned.

Up to three years ago many of the African protectorates were under the tutelage of the Foreign Office, while the older colonies were under the Colonial Office. The reports of Boundary Commissions are therefore scattered through official documents in the two offices, and are drawn up upon no uniform model. Now that the superintendence of all these territories has been handed over to the Colonial Office, and that body has set itself such an excellent example in the appointment of the Colonial Survey Committee and the publication of its reports,

it is greatly to be hoped that they will follow up the good work and systematize and publish all these Boundary Commission reports. If a model for such a publication is desired, I may refer to the account of the demarcation of the Turko-Egyptian frontier between Rabah on the Mediterranean to the Gulf of Akaba, lately issued by the Egyptian survey.

The account which I have endeavoured to give you, short and imperfect as it is, of the present state of the mapping of British Africa will have shown you clearly that there is a large amount of excellent work now in course of execution, and that there has been, especially during the last few years, very considerable progress made towards co-ordinating this work and towards maintaining certain fixed standards of accuracy, rapidity and economy.

It will naturally occur to you to inquire whether this co-ordination could not advantageously be pressed a step further, and whether all the isolated survey departments, now working in the various colonies and protectorates, could not be amalgamated under one executive head; whether, in fact, a Survey Department of Africa, precisely analogous to the Survey Department of India, could not be formed. The advantages of such a step are obvious, but must not be allowed to blind us to the difficulties. We have, in the first place, the objection to be met that the South African colonies would, under present circumstances, almost certainly refuse to join in any general scheme, and would not consent to any arrangement whereby money raised in one colony would be spent outside its own geographical limits. If, however, we leave South Africa out of the question the financial difficulty tends to disappear. Both our East and West African possessions are, in general, not yet in a position to maintain themselves, and are still, and will be for some time to come, partially supported by grants from the Imperial Treasury. To divert a portion of these grants to pay for the maintenance of a survey department would only be a matter of account and could be adjusted so as to cause no hardship to any one colony. There remains the geographical difficulty of space. The fact that the heads of the department would have to keep in close personal touch with countries differing entirely in character, and perhaps three months' journey from each other, does not appear to offer any insuperable objections, and I cannot avoid expressing the hope that it may be found possible at a no very remote date to take some steps in the direction of a consummation which appears so desirable.

In giving my evidence before the Royal Commission on the War in South Africa, presided over by Lord Elgin, I outlined the general features of a scheme under which the Imperial Government would undertake the topographical mapping of all our oversea possessions, apart from self-governing colonies. As on this occasion I was considering the whole question more exclusively from the military side, no reference was then made to the question of cadastral maps, and it was tacitly assumed that these would fall to be constructed by the land office or a land survey department belonging to each separate colony. On the present occasion we are not restricted to the military point of view, but are permitted a wider outlook. Our task is to consider the map in all its aspects, both as regards its method of construction and its ultimate use, whether for military, administrative, engineering, or purely scientific purposes. This enlargement of our scope does not, I think, modify our previous conclusions, and were I now called upon to devise a scheme for the mapping of British Africa, I should base it upon the principle of a central Imperial body for executing the triangulation and topography, leaving the land survey to local organizations.

The arguments in favour of this policy are manifold. As regards the triangulation they hardly require stating. It will be obvious to all that such work

must be closely co-ordinated, and that some central, directing head is imperatively called for. The enormous waste of money that is ultimately involved by tolerating imperfect work, of which many examples could be cited, is alone a sufficient justification for holding this view. We may, however, pause to examine a little more closely into the advantages of centralization as regards one particular operation in a survey. That is the measurement of the initial base line upon which the accuracy of the whole framework depends. This task used to be one of the most laborious and difficult with which the surveyor is confronted. The apparatus employed, some form of compensation bar, was cumbersome and difficult to use, the site selected had to be levelled, and the preparatory alignment carried out with the most scrupulous care. Thus the Loch Foyle base for the triangulation of Great Britain and Ireland was about 6 miles long, and the actual measurement, quite apart from the time spent on the preparation of the ground, took sixty days, an average rate of work of just over 500 feet per working day.

A few years ago the discovery was made of the nickel-steel alloy with a very small or zero coefficient of expansion, the so-called invar. This valuable metal, by abolishing the necessity for any temperature correction, has enormously simplified all physical measurements of length, and, *à fortiori*, those measurements, such as base lines, which are perforce done in the open air and over a large range of temperature. Survey bases are now measured with an invar wire stretched to carefully regulated tension, and either laid along a flat trough, or, what appears to give equally good results, hung freely between supports. The gain in precision due to the avoidance of errors of expansion or contraction in the measuring apparatus is substantial, while the gain in rapidity is very great. Thus, as a contrast to the Loch Foyle base, let me give a short account of the measurement of a base in Spitsbergen by the Russian party of the joint Swedish and Russian missions in 1900, extracted from a review already written for the *Geographical Journal*.

The conditions for accurate work were very unfavourable: no site even approximately flat could be found, and the base was therefore irregular in contour and traversed rough and in some parts marshy ground. The weather conditions were far from ideal. The cycle of operations was as follows: An auxiliary base 175 metres long was measured with Struve's apparatus, twice before the main base measurement and twice afterwards. The two wires used for the main base were standardized on this subsidiary base four times, twice before and twice after use. The main base, 6.2 kilometres long, was measured twice in each direction by each of two wires, eight measures in all. The limit of error in the final value was 17 millimetres—say, one part in 360,000.

The whole of these operations, including the laying out of the standard and the comparison of the wires, were completed in a period of three weeks; Monsieur Backlund, who superintended the actual measurement, left the observatory at Pulkowa on June 11 and returned to it on July 24. It was, therefore, possible to standardize the wires not only by the check base upon the spot, but also by the permanent standards of the observatory within three weeks of their use for the actual measurement. It need hardly be pointed out that this was eminently favourable to the attainment of the highest exactitude, and we have here a marked example of the value of centralization. The proposed trigonometrical survey department of Africa would probably find it advantageous to adopt similar procedure, and, instead of trusting a base measurement to a local staff unacquainted with the work, it would send out one or two men of highly trained technical skill equipped with the best apparatus. The money spent in journeys would be more than saved—firstly, by the unquestionable gain in accuracy and the consequent avoidance of the costly necessity for repeating bad work; and, secondly, by the

gain in time, due to the fact that the local staff would not be called upon to learn the use of an unfamiliar set of instruments.

Similar advantages would arise from a partial specialization of the angular measurements. Thus the first-class observer with a theodolite must possess certain qualities of eyesight, health, and judgment, rarely combined in one individual. When such a combination of qualities is found it should be made the best use of, and a good man should not be wasted on second-class work. At present, upon the system of regarding each colony as an isolated unit, it is not possible to employ every man to the highest advantage, and there are doubtless many examples at present in Africa of able men being set tasks much below the standard of their ability and, *per contra*, men of no such qualifications being given work beyond their powers. It is only by working with an extended organization, employing a large staff, and responsible for a large area of country that any approximation can be made towards that ideal wherein every member of the establishment is used to the best advantage according to his special qualifications.

To turn from the triangulation to the question of topography, we shall find analogous arguments in favour of entrusting this work to one central department. Whether we consider the necessity for a uniform system of training for the topographer, or whether, looking at the matter from the other side, we consider the desirability of a close degree of uniformity in the resulting map, we arrive at the same end. Nor need we confine ourselves to theoretical arguments; practical results are before us as examples. It is not possible at the present moment to point out a single case of a thoroughly satisfactory topographical map of any country whatever which has not been executed by men trained in a properly organized survey department or, what is equivalent, in the Corps of Royal Engineers. Examples of failure to accomplish this are numerous. Thus we have the cases of the British Colonies in South Africa before the war; of Canada, where no topographical map existed until two years ago, when the work was taken up by the military department; and of Ceylon, where, in spite of the vast sums spent on survey and the small size of the island, no topographical map of the slightest pretensions to completeness exists of any part of the country.

It may also be noted that, especially in the case of a developing country, it is of enormous advantage that the map shall be begun and finished within some reasonable time. If a long interval elapses between the commencement and the completion, the first sheets are out of date before the last are done and the whole exhibits a most undesirable lack of uniformity.

With a central organization the mapping of each protectorate can be taken up in turn and dealt with rapidly, thus producing a homogeneous map, impossible to a small local body. Upon the converse point the question as to whether our central department should or should not undertake cadastral survey the arguments are perhaps not so one-sided. It is, however, quite clear towards which side the balance of advantage tends. Taking into account the intimate connection of the cadastral survey with the system of land holding and land taxation, the fact that these systems necessarily vary and that as a financial matter of account the receipts and expenditure of each colony are separate, it is not difficult to see that the land survey is better left to local control. This would not preclude any particular colony from arranging with the central body for the execution of any definite piece of work of this class, upon terms agreeable to both sides, in a similar manner to that in which cadastral survey is executed by the Indian survey for provincial Governments, and it need hardly be pointed out that the geodetic points fixed by triangulation would in any case be available as a framework for the large-scale map.

The geographical survey of the British Empire, apart from Africa, will not on this occasion detain us long. I exclude from present consideration the great self-governing colonies—Canada, Australia, and New Zealand—and also the whole country lying within the sphere of the survey of India. Ceylon has an elaborate land survey system; and though, owing to past mistakes, the geographical mapping of the island is in a most lamentably backward condition, there are good grounds for hope that this state of affairs will be remedied in the near future. The Malay States, where, owing to the fertility of the soil and the ubiquity of rich tin ore, the land values are high, have the basis of an excellent survey system, and possess a backbone of triangulation which will eventually extend southward to Singapore, and possibly northward to join the Indian series in the south of Burma. Hongkong, including the leased territory on the mainland, is of small area and of no appreciable geographical importance. It has been adequately mapped for military purposes. Of our insular possessions, Mauritius, St. Helena, and (in the Mediterranean) Cyprus and Malta are thoroughly surveyed. The other islands scattered throughout the ocean which fly the Union Jack, including the West Indies, while their coast-lines have naturally been the subject of close attention by the Hydrographic Department of the Admiralty, are, as regards their internal geographical features, still quite imperfectly known. The large and important territory of British Guiana is entirely unsurveyed, and indeed in part almost unexplored.

You will thus realize that if we are prepared to admit the validity of the premise that the mapping of its own territory is an imperative duty of a State which aspires to justify itself before the nations as the possessor of a world-wide Empire, there is still plenty of employment for the scientific geographer in the British dominions.

Having thus far spoken of our duties and obligations, for such they appear to me, which lie abroad in countries remote from our own shores, let us now turn our eyes inward and see if we cannot discern some similar duties lying close to our hands.

I take it that the great majority of us have been brought up in the idea that our own Ordnance Survey is of such a high order of accuracy that a proposal to undertake a revision of the fundamental triangulation of the British Isles must appear strange. Yet this idea will not be a new one to the British Association, for two years ago at the York meeting I brought the subject before this section in a short note, which gave rise to a useful discussion.

What I shall say now will be in a large measure a repetition of my previous remarks, a repetition for which I need offer no apology, as it will be apparent to you that had any steps been taken to remove this standing reproach to British geodetical science no recurrence to the subject would be called for. As matters stand, however, I feel impelled to recur to it with increased emphasis, a position in which I am confident of being supported by all those who earnestly care for the scientific repute of our country. Some few years ago, at the request of the International Geodetic Conference, a volume was prepared by General Ferrero, the eminent Italian geodesist, giving a summarized account of all the geodetic surveys of the world. If we take this volume and examine the relative degree of precision of the different national surveys there enumerated we shall find that Great Britain stands lowest on the list.

The popular illusion, for it is really no other, as to the extreme accuracy of the triangulation of the British Isles rests in no small degree upon what must be considered a fortuitous circumstance, namely, the accidental smallness of the closing error. Have we not all been told how at the conclusion of the triangulation, when the observations had been carried from the primary base on the shore of

Loch Foyle across part of Ireland and across Wales and England, terminating in two points on Salisbury plain, the distance between these points was calculated, using as data the measured length of the Loch Foyle base and the observed angles of the triangles across the country? The distance between the same two points was then measured with every refinement of accuracy, and the measured length compared with the calculated length. The difference between them was found to be 20 inches. If in traversing a large portion of the kingdom the aggregate error only amounted to this minute quantity—minute, that is, compared with the distances involved—how can we either expect or demand a better result, even if the work be redone with the most refined methods that the accumulated experience of the last fifty years can suggest?

To answer this question we must bear in mind that the closing error of a piece of work such as a triangulation is not the only, nor indeed the best, test of its precision. A small closing error may be due to accident; larger discrepancies may have occurred at intermediate stages which have chanced nearly to cancel themselves at the end. Such undoubtedly did happen in this case. The work was not as accurate as the smallness of the closing error would seem at first sight to imply. We have, however, in such a case an absolute measure of relative precision in the magnitude of the average triangular error, being the quantity by which the sum of the observed angles of a triangle exceeds or falls short of the true value of  $180^\circ + \text{spherical excess}$ .

From this we can readily deduce the "probable error" of a single observed angle, a form in which the measure of precision of a triangulation is often expressed.

In our British survey this quantity equals 1.20 seconds of arc, while in good modern work it does not in general exceed 0.25 second. Making due allowance for the fact that the network of triangles over our islands is a complicated one, and therefore that the ultimate precision is considerably greater than that of a chain of triangles of the same order of individual accuracy, we are probably justified in concluding that a resurvey would at least halve the final errors. Such a resurvey is urgently demanded in the interests of international geodesy.

It will, of course, be clearly understood that this implies no adverse criticism upon the work of the men who originated and carried out the primary triangulation of the British Isles. For that great achievement we must all have the most sincere admiration. It was the pioneer work of the highest order; it set a standard of accuracy never before attained, and was for long taken as the model for such work in other countries. It was, however, started at the end of the eighteenth century and was completed in 1857. It is therefore hardly surprising that it falls somewhat short of the precision of modern observations of the same class. It will also be understood that this resurvey does not affect the question of the reliability of our Ordnance Survey maps. Any errors which exist in our triangulations are important only for geodetic discussions, such as the determination of the exact figure of the Earth, and are quite negligible for map-making purposes. There can be no appreciable error from this cause upon the maps of our own country, even those on the largest scales, and no question of reconstructing our maps can arise. This is fortunate from our financial point of view. Such a reconstruction would involve a very heavy expenditure, while the cost of the retriangulation suggested would be quite trifling compared with the actual annual expense of our national surveys.

The result of this inferiority in accuracy of the British survey is that it is useless to co-ordinate it with the continental series of geodetical purposes. This defect is all the more noticeable in that the necessary observations for joining up

the two series were actually made. Three stations on the coast of Kent—St. Peter's church, between Margate and Ramsgate; Coldham, a hill about 2 miles north of Folkestone; and Fairlight, a hill about 4 miles north-east of Hastings—were connected trigonometrically with three stations in France—Montlambert; near Boulogne; St. Inglevert, over the village of Wissant; and the Clock Tower at Gravelines. This was done in 1861–3. The observations were of a high order of precision. It would not be necessary to repeat them.

The importance of the co-ordination is apparent when we inspect a map of Europe with the neighbouring part of Africa, upon which the triangulation lines are entered. We then see that the British part of the work is imperatively required to extend, and in fact to complete at one end in each case, two important geodetic arcs, viz. the meridional arc along the meridian of Greenwich and the longitudinal arc along the latitude of  $52^{\circ}$  N. Without the British portions these arcs extend from Ain Sefra in Algeria to Gravelines in France, an amplitude of  $18^{\circ}$ , and from Orsk in Russia to the same point in France, an amplitude of  $57^{\circ}$ . With the British section added they would be further extended to Saxavord, the northernmost point of the Shetland islands, and to Valentia, on the west of Ireland, respectively. The added amplitudes would be  $10^{\circ}$  and  $11\frac{1}{2}^{\circ}$ , very material additions, which would undoubtedly prove of substantial scientific value.

It will thus be seen that it is by no means necessary, or even desirable, to re-observe the whole network of triangles covering our islands. All that is required is to connect geodetically the three extreme points—Saxavord, Valentia, and the stations on the Kent coast just mentioned.

A knowledge of the exact figure of the Earth is of high scientific importance, especially so in reference to recent speculations as to its possible deviation from a spheroidal form. It cannot be other than a subject of national shame that so important a link in this research remains unfilled. We may note with gratification the forward position that our nation has in the past taken in the advancement of geodesy. We know the great work done in the triangulation of India, and we have alluded to the magnificent conception of the Cape to North Sea are due to Sir David Gill. Surely it is not asking too much that we should take steps to set our own house in order, and to ensure that our own triangulation is at least as accurate as that covering the neighbouring portions of the continent of Europe. The subject is one upon which the powerful influence of the British Association might legitimately be brought to bear, and any representations from our body would come with a peculiar appropriateness from this the Dublin meeting, seeing that so large a section of the work, whose importance we wish to urge upon the Government, lies upon Irish soil, whose execution would therefore devolve naturally on the Ordnance Survey of Ireland.

In concluding this address I feel constrained to apologize for what may have appeared to some of you the dull and unromantic character of my theme. I am too well aware that to many the idea of geographical advance is confined to the perilous traversing of virgin lands, to the navigation of unknown waters, and to the penetration of forests or deserts never yet trod by white man's feet. I am conscious that the substitution of the surveyor for the explorer has necessarily destroyed much of the old romance, and that the feelings born when any fraction of the Earth's surface was for the first time opened to our ken can never be revived. While, however, the romance has gone the dangers remain, and there is as much call now for unflinching courage and for unselfish devotion to duty as there was in the days when the search for the sources of the Nile was an impelling cause sending adventurous men into the unknown. Whether occupied in cutting his way through the almost impenetrable forests of the Gold Coast or

struggling with the papyrus swamps of the Nile basin, or whether, standing upon the top of some old volcanic hill, he is engaged in scanning the blue distances of the great Rift valley, the surveyor is not less worthy of your admiration than the earlier traveller whose name is perhaps honourably enshrined in that of river or mountain. Whether pushing his way through the jungles of the Malays or floating upon the muddy stream of an African river, whether he is braving the attacks of savage animals, of treacherous natives, or the far more insidious assaults of the germs of some deadly disease, he is equally deserving of your sympathy and your encouragement. He is in truth a shining example of the power of that spirit of adventure and thirst for information which has carried our race so far in the past, and which in the future is, we all trust, destined to lead us ever "upwards and on;" the spirit that esteems no sacrifice too great in the cause of duty, and recognizes no duty so high as that of making some contribution towards the increase of natural knowledge.

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### ENVIRONMENT AND RACE.\*

By Prof. WILLIAM RIDGEWAY, M.A., F.B.A., Litt.D., LL.D.

LET us consider some of the chief problems which at present are being debated by the physical anthropologists. Foremost in importance of these is the stratification of populations in Europe. It has generally been held as an article of faith that Europe was first peopled by a non-Aryan race. Of course it is impossible for us to say what were the physical characteristics of palæolithic man, but when we come to neolithic man the problem becomes less hopeless. It has been generally held that the first neolithic men in Europe, whether they were descended or not from their palæolithic predecessors, had long skulls, but were not Aryan; that later on a migration of short-skulled people from Asia passed along Central Europe and into France, becoming what is commonly termed the Alpine, by some the Ligurian, by others the Celtic race; that later these two primitive non-Aryan races were overrun by the Aryans, who, when these theories were first started, were universally considered to have come from the Hindu Kush, but are now generally believed, as held by Latham, to have originated in Upper Central Europe. Yet, although the view respecting the cradle of the Aryans has changed, anthropologists have not seen the important bearing that it has upon the problem of neolithic man. The Aryans are generally held to have had a blonde complexion.

As our discussion must from its nature concern itself with questions of race, let us first examine the criteria by which anthropologists distinguish one race from another. If you ask an anthropologist how he distinguishes an Aryan from a non-Aryan race, he will tell you that he relies on three main tests: (a) the colour of the skin, hair, and eyes; (b) the shape of the skull and certain other osteological characteristics: and (c) the system of descent through males. Formerly language was included in the tests of race, but when it is pointed out that the Negroes of Jamaica speak English, those of Louisiana French, henceforward it was assumed that one race can embrace the language of another with the greatest ease. Yet it may turn out, after all, that language was too

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\* Extracts from the presidential address to the Anthropological Section ('The Application of Zoological Laws to Man'). British Association, Dublin, September 3, 1908.

hastily expelled from the criteria of race. On the other hand, we may find that too implicit faith has been placed on the three criteria of cranial characteristics, pigmentation, and law of succession.

(a) As it is assumed that all Aryans were blonde and traced descent through males, so it is held that all Europeans, who are dark complexioned, and whose forefathers traced descent through women, are non-Aryan in race, and that, although they now in almost every case speak an Aryan tongue, this is not their primitive speech, but simply that learned from their Aryan conquerors. According to this orthodox view, the dark-skinned inhabitants of Italy, Spain, and Greece are all non-Aryan, and all have borrowed the language of their masters, whilst of course the same is held respecting the melanochrous population of France and of the British Isles. Ever since Prof. Sergi comprehended under what he terms the "Eurafrican species" all the dark complexioned peoples of Southern and Western Europe, as well as the Semitic and Hamitic peoples of Western Asia and Northern Africa, the doctrine that the dark-skinned peoples of Europe once spoke a non-Aryan tongue or tongues is supposed to have been finally established. But under his Eurafrican species Sergi includes the blonde race of Northern Europe who speak Aryan languages along with the dark races who speak non-Aryan tongues. It is argued that as all the dark-skinned peoples on the north side of the Mediterranean belong by their physical type to the same original stock as the Semites and Hamites, they must likewise have spoken non-Aryan languages. Yet it might as well be maintained that the Finns, who speak a non-Aryan tongue, and the Scandinavians, who speak an Aryan, were originally all of one stock, because both races are blonde.

This doctrine of a Mediterranean race depends upon the tacit assumption made by the physical anthropologists that identity or similarity of type means identity of race. Yet this assumption does not bear the test of scientific examination, for it assumes that only those who are sprung from a common stock can be similar in physical structure and coloration, and it leaves altogether out of sight the effects of environment in changing racial types, and that, too, in no long time. The change in the type of the American of New England from that of his English ancestor and his approximation to the hatchet face and thin scraggy beard of the Red Indian have long been remarked, whilst the Boers of South Africa, in less than 150 years, have quite lost the old Dutch build, and become a tall weedy race. The effects of climatic conditions are very patent amongst the native peoples of the New World. The Iroquois of the temperate parts (lat. 40°-45°) of North America were a tall rather light-complexioned race, but as we keep moving south and approach the equator, their kindred tribes grow somewhat darker in complexion and more feeble in physique, except where they live at a considerable altitude, for of course altitude acts in the same way as latitude. When once we pass below the equator the physique keeps steadily improving until we come to the Pampas Indians, a vigorous race who defied all the efforts of the Spaniards to subdue them; and finally we meet the Patagonians (lat. 40°-53°), a fine, tall, light-complexioned race, who form in the south the counterpart of the Iroquois and their closely allied tribes in the north.

The same law, as is well known, can be seen at work in Europe. Starting from the Mediterranean, we meet in the lower parts a melanochrous race; but gradually, as we advance upwards, the population as a whole is growing less dark, until finally, along the shores of the Baltic, we meet the tallest and most light-complexioned race in the world. Of course it has been explained that the change in pigmentation, as we advance from south to north, is due to the varying proportions in the admixture of the blonde race of the north with the melanochrous

of the south. But it is difficult to believe that the movements up or down of the people from the southern side of the Alps, or of those from the shores of the Baltic, have been so nicely proportioned as to give the general steady change from north to south in coloration without the aid of some other force. The case of America, which I have just cited, is in itself enough to raise a suspicion that climatic influences are at work all the time, and that environment is in reality the chief factor in the variation of both stature and pigmentation from the Mediterranean to the Baltic. The white race of the north is of the same proximate ancestry as the dark-complexioned peoples of the northern shores of the Mediterranean. I have already argued elsewhere that, as the ice-sheet receded, mankind kept pressing farther north, and gradually under changed climatic conditions the type changed from area to area, and they all still continued to speak the same Indo-European tongue, but with dialectic variations, these also being, no doubt, due to the physical changes in the vocal organs produced by environment.

If we turn from man to the other animals we find a complete demonstration of this doctrine. For instance, the conditions which have produced a blonde race on the Baltic have probably produced the white hare, white bears, and the tendency in the stoat and the ptarmigan to turn white in winter, whilst in the same regions of Europe and Asia the indigenous horses were of a dun colour, who not only turned white in winter, but had a great tendency to turn white altogether. It may be objected that the Lapps and Eskimo are not tall and blonde, but on the contrary short and dark; but they live within the arctic circle in regions where the sun does not shine at all for a great part of the year, and consequently they are quite outside the conditions of environment under which the tall blonde race of North Germany has long dwelt. Of course, in dealing with man we are always confronted with the difficulties arising from his migrations; but if we can find a family of lower animals who cannot be said to have thus migrated, and who show the effects of environment, we shall be able to argue powerfully from analogy.

The horse family supplies the example required. If we follow it from Northern Asia to the Cape of Good Hope, we shall find that every belt has its own particular type, changes in osteology as well as in coloration taking place from region to region. First we meet the old dun horse, with its tendency to become white, the best European examples of which were probably the now extinct ponies of the Lofoden Isles. In Asia, Prjevalsky's horse is the best living instance—a dun-coloured animal with little trace of stripes. Bordering on the Prjevalsky horse or true tarpan come the Asiatic asses—first the dzegetai of Mongolia, a fawn-coloured animal, the under parts being Isabella-coloured; then comes the kiang of the Upper Indus valley, seldom found at a lower altitude than 10,000 feet, rufous brown with white under parts, whilst, as might be expected from its mountain habitat, its hind-quarters are much more developed in length and strength than in the asses of the plains. The *Onager indicus*, *onager*, and *hemippus* are found in all the great plains of the Punjab, Afghanistan, Western India, Baluchistan, Persia, and Syria, whilst a few are said to survive in South Arabia. All these are lighter in colour than the kiang, the typical onager being a white animal with yellow blotches on the side, neck, and head. All the Asiatic asses are distinguished by the absence of any shoulder stripe, though they occasionally show traces of stripes on the lower parts of the legs. The southern Asiatic asses just described in their greyer colour and smaller hoofs approximate to the wild asses of Africa, especially to those of Somaliland, whilst it is maintained that in their cry, as well as in their colour, the kiang and dzegetai come closer to the horse, whose next neighbours they are.

Passing to Africa, we find the ass of Nubia and Abyssinia showing a shoulder stripe, and frequently with very strongly defined narrow stripes on the legs, the ears being longer than those of the onager. But in closer proximity to South-Western Asia comes the Somali ass, which differs from those of Nubia and Abyssinia by being greyer in colour, by the entire absence of shoulder stripes, and by smaller ears, in all which characteristics it comes closer to its neighbours on the Asiatic side than it does to its relations in Abyssinia and Nubia.

Next we meet the zebras. First comes the magnificent Grévy zebra of Somaliland, Shoa, and British East Africa. It is completely striped down to its hoofs, but the coloration of the specimens from Shoa differs from that of those from Somaliland, and from those of British East Africa. The Grévy zebra has its hoofs rounded in front like those of a horse, but its ears are more like its neighbours the asses than those of any other zebra. In the region north of the river Tana the Burchelline group of zebras overlaps the Grévy, and though it differs essentially in form, habits, and shape of its hoofs from the Grévy, some of those in the neighbourhood of Lake Barringo show gridiron markings on the croup like those on the Grévy zebra, whilst, like the latter, they also possess functional premolars. All the zebras of the equatorial regions are striped to the hoofs, but when we reach the Transvaal, the Burchelline zebra, known as Chapman's, is divesting itself of stripes on its legs, whilst the ground-colour is getting less white and the stripes less black. Further south the true Burchell zebra of the Orange river has completely lost the stripes on its legs and under-surface, its general colouring being a pale yellowish brown, the stripes being dark brown or nearly black. South of the Orange river the now extinct quagga of Cape Colony had not only begun to lose the stripes of its under part and on the hind-quarters, but in Daniell's specimen they only survived on the neck as far as the withers, the animal having its upper surface bay and a tail like that of a horse, whilst all specimens of quagga show a rounded hoof like that of a horse.

In the quagga of 30°-32° S. we have practically a bay horse corresponding to the bay Libyan horse of 30°-32° N. lat. But the production of such variations in colour do not require great differences in latitude. On the contrary, from a study of a series of skins of zebras shot for me in British East Africa, each of which is from a known locality and from a known altitude, there can be no doubt that such variations in colour are found from district to district within a comparatively small area. In addition to the two species of zebra already mentioned, there is the mountain zebra, formerly extremely common in the mountainous parts of Cape Colony and Natal, though now nearly extinct in that area. Its hind legs, as might naturally have been expected from its habitat, are more developed than those of the other zebras, just as these same limbs are also more developed in the kiang of the Himalayas than in any other ass.

With these facts before us, there can be no doubt that environment is a most potent factor not only in coloration, but also in osteology. No less certain is it that environment is capable of producing changes in animal types with great rapidity. Thus, although it is an historical fact that there were no horses in Java in 1346, and it is known that the ponies now there are descended from those brought in by the Arabs, yet within five centuries there has arisen a race of ponies (often striped) some of which are not more than 2 feet high. Darwin himself has given other examples of the rapid change in structure of horses when transferred from one environment to another, as, for instance, when Pampas horses are brought up into the Andes.

Another good example is that of the now familiar Basuto ponies. Up to 1846 the Basutos did not possess a single horse, those of them who went down and worked for the Boers of the Orange river usually taking their pay in cattle. At the date mentioned some of them began to take horses instead. These horses were of the ordinary mixed colonial kinds, and we may be sure that the Boers did not let the Basutos have picked specimens. The Basutos turned these horses out on their mountains, where, living under perfectly natural conditions, their posterity within less than forty years had settled down into a well-defined type of mountain pony.

Nor is it only in the horse family that we meet with examples of the force of environment. The tiger extends from the Indian ocean, through China up to Korea, but the tiger of Korea is a very different animal from that of Bengal. Instead of the short hair of the Indian tiger the Korean has clothed himself with a robe of dense long fur to withstand the rigours of the north. It is not unlikely that if we had a sufficient number of skins from known localities, we could trace the change in the tiger from latitude to latitude, just as I have shown in the case of the Equidæ.

Now, whilst there is certainly a general physical type common to all the peoples round the Mediterranean, it by no means follows that all those peoples are from the same original stock. On the contrary, the analogy from man in other parts of the world, as well as that of the Equidæ, suggest that the resemblance between the Berbers, who speak Hamitic, the Greeks who speak Aryan, and the Jews and Arabs who spoke Semitic, is simply due to the fact that those peoples from having long dwelt under practically similar conditions in the Mediterranean basin, have gradually acquired that physical similarity which has led Sergi to the assumption that they have a proximate common ancestry, and that they accordingly form but a single race.

Nor is there any lack of instances of convergence of type under similar conditions in the case of the lower animals. We saw that the asses of South-western Asia approximate in colour to the asses of North-east Africa, and in respect of the size of the ears and absence of shoulder-stripe, more especially to the nearest of these, the ass of Somaliland. Yet it does not follow that they are more closely related to the Somali ass than they are to their own next neighbours, the kiang. On the contrary, it is much more likely that the Somali ass is closely related to those of Abyssinia, and that the South-Western Asiatic asses are closely related to the kiang. The approximation in colour, absence of shoulder-stripe, and size of the ears between the asses of Somaliland and those of South-Western Asia must rather be explained by a convergence of types under the somewhat similar climatic conditions of Somaliland and the nearest parts of South-Western Asia. Again, though there are very strong specific differences between the Grévy and Burchelline zebras met in the neighbourhood of Lake Baringo, there is a curious approximation not only in marking but also in the teeth between these two species, which is best accounted for by supposing that it is the outcome of similar environment. It may be said that this approximation may be due to the interbreeding of the two species of zebras in the region where they overlap. This, in itself a most unlikely contingency from all that is known of the habits of wild species, certainly cannot be alleged in the case of the convergence in type between the asses of South-Western Asia and the Somali ass, since they are separated by the Red sea and the Persian gulf.

Again, the representative of the crocodile family in the Ganges is distinguished by the extreme elongation of the head and jaws, whilst the same elongation of the head is equally characteristic of the representative of the dolphin

family found in the same waters. Again, all through the Indian Ocean wherever any family of crabs have become inhabitants of coralline sands its members have long legs. Again, it has long been noticed that in Cutch all the larger animals have a tendency to become a sandy colour, whilst in certain areas of South America insects, no matter to what family they belong, have a tendency to one common aspect.

It may of course be said that the changes in colour of the horse family, tigers, and insects are for "protective" reasons. But the case of the horse family alone is sufficient to dispose of this objection. The kiang of the Himalaya had no dangerous enemy until man was armed with a rifle. In Africa the zebras have had only two formidable foes—man and the lion. It is asserted by the most experienced hunters that the gaudy livery of the zebra makes him conspicuous from afar, whether he is on the mountain, on the plain, or in the shade of a tree. His brilliant colour therefore really exposes him to man. But it will be said that it is well adapted to conceal him at night, at which time the lion seeks his prey. Yet as the best authorities hold that the lion hunts entirely by scent, the coloration of the zebra affords him no protection against his inveterate foe.

I have shown that in horses the colours—such as bay, black, grey, and white—accompany certain well-defined inward qualities. But as black is most certainly not a primitive horse colour, it follows that coat colours may be intimately connected with certain other characteristics quite irrespective of protective colouring. Again, as the variation in the size and shape of the ears and hoofs of the asses and zebras cannot be set down to protective colouring, but must be due to other causes, there is no reason why variations in colour should not be ascribed to similar causes.

The argument based on the analogy of the horse family and the tigers, and on that of the natives of the New World, may be applied to the races of Africa. Next to the Mediterranean lie the Berbers and their Hamitic congeners, who are regarded as part of the Eurafian species by Sergi and his school. But the Berbers are not all of the typical Mediterranean physique. The blonde Berbers of the highlands of Rif in North-West Morocco and of the Atlas have long been well known. In the region lower down and in Western Tunis the occurrence of the xanthochrous type seems much less frequent, whilst further east it practically disappears.

It is certain that there was a fair-haired element in Libya long before Rome conquered Carthage or the Vandals had passed into the ken of history. Callimachus testifies to the existence of blonde Berbers in the third century B.C. We may hold, then, with Sergi and others that the blonde element in the Berbers is not a survival from invasions of Vandals or Goths, or from Roman colonists, but that they rather owe their fair complexions and light-coloured eyes to the circumstance that they were cradled in a cool mountainous region, and not along the low-lying border of the Mediterranean like their dark-coloured relations whose language and customs they share. If, then, some of those who speak Hamitic are fair, and have been fair for centuries before Christ, as Sergi himself admits, whilst others are dark, there is no reason why some of the peoples who speak Aryan might not be dark whilst others are blonde.

The Berbers and their Hamitic congeners shade off on the south into other peoples, but this is not altogether due to intermarriage, as is commonly held, for it is more probably to be explained as due in a large part to climatic conditions. The Bantus, who are said to have originated in the Galla country and to have spread thence, are now regarded by the chief authorities as the result of an intermixture of Hamites and Negroes. But, on the grounds I have already stated,

it is more rational to regard them as having been evolved in the area lying between the Hamitic peoples on the north and the Negroes on the south, just as we have corresponding types of the horse family in Nubia and Abyssinia and in the equatorial regions. The same hypothesis also explains the existence of those cattle-keeping tribes which lie west of the Nile stretching across Northern Nigeria, who border on the Berbers, but yet differ from them, and border also on the Negroes, but differ from them likewise. South of these tribes come the Negroes, the true children of the equator. The Bantu is able to live in elevated equatorial areas, and he has burst his way down to the sub-tropical and temperate parts of south Africa, where he especially flourishes in the highlands, thus showing that his race was originally evolved under similar conditions. The Bantu found in the south the Hottentots, who are especially distinguished by steatopygy, a feature which has led some to identify them with the primitive steatopygous race supposed to have once lived in Southern Europe, Malta, and North Africa, and to have left evidence of their characteristic in their representations of themselves. But, granting that such a race once lived in North Africa and Southern Europe, there is really no more reason for supposing that they and the Hottentots formed one and the same race than there is for assuming that Daniell's quagga, which was practically a bay horse, was proximately akin to the bay horse of North Africa. The occurrence of steatopygy in two areas so wide apart is not due to an ethnical migration, but rather to similar climatic conditions producing similar characteristics.

As some anthropologists so commonly explain the origin of races such as the Bantus by intermarriage, it may be well to see whether intermarriage between two races, one of which is an invader, is likely to produce a permanent effect upon the general physique of a whole community. I have shown elsewhere that the many invasions of fair-haired races into the three southern peninsulas of Europe and into the Aegean islands have left no permanent trace on the population. It is a matter of common knowledge that the offspring of British and native parents in India have a constant tendency to die out. The same undoubtedly holds true for the offspring of British soldiers serving in Egypt, the Sudan, and West Africa. The native race always reasserts itself. In America the Spanish blood has died out, or is dying out, everywhere except in the temperate regions of Chile, Quito, and Argentina, where the descendants of the Spanish settlers thrive in a climate very analogous to that of Spain. In the Southern States of North America the whites cannot flourish, and only just manage to survive. On the other hand the descendants of the negro slaves imported into Brazil, the West Indies, and the Southern States of North America thrive and multiply with extraordinary vigour; a fact doubtless due to their race having been evolved under similar conditions in equatorial Africa.

Even from the evidence already to hand there is high probability that intermarriage can do little to form a new race unless the parents on both sides are of races evolved in similar environments.

I have already pointed out that although the fair-haired race of upper Europe has age after age kept pouring over the Alps into Italy and the other southern peninsulas, and have constantly intermixed with the indigenous populations, it is only in the upper part of Italy that the blonde race is able to hold its own. In Italy the xanthochrous race in ancient times as to-day had its maximum along the Alps, and gradually dwindled towards the south until the melanochrous race stood practically alone in the lower part of the peninsula. So too in the Balkan, whilst the fair-haired element was at its maximum along the Alps and the Danube, southwards the melanochrous becomes more and more completely dominant, as it practically is to-day in the lower part of the peninsula.

(b) In the Alpine regions there has been from Neolithic times a brachycephalic race, also found in central France and in the British Isles, whither it is supposed to have come in the Bronze age. It has been a fundamental article of faith with Sergi and others that this round-headed race came from Asia, the home of brachycephalism. It is Mongolian according to most, and spoke a non-Aryan language; but Sergi regards it as Aryan, thus reverting to the old doctrine, which made the Aryans come from central Asia, and he assumes that these invaders imposed their language both on the aborigines of Italy, such as the Ligurians, and on the blonde race of northern Europe; but we shall soon see that this assumption has no base. Now, as these folk dwelt in the region where we find the Ligurians of historical times, others have argued that the Ligurians were a non-Aryan people from Asia. But it is impossible to find any hard-and-fast lines between the Alpine race and the peoples north and south of it in culture and sociology. For that reason when treating of the people of the Alps in my 'Early Age of Greece' I did not take any account of the difference in cranial measurements. In 1906, at the British Association, I maintained that this difference of skull type did not mean any racial difference, and on the analogy of the changes in the osteology of the Equidae I urged that the roundness of the skulls was simply due to environment, as the horses of the Pampas when brought up into the mountainous regions of Chile and Peru rapidly change their physical type. Physical anthropologists have already maintained that the round head of the Mongolian has been developed in the high altitude of the Altai. If that be so, there is no reason why a similar phenomenon should not have taken place in the Alpine region, in Albania, Anatolia, and wherever else in mountain areas brachycephaly has been found in more than sporadic examples, which of course may well be due to migrations or importation of slaves. But I am far from suggesting that altitude is the only cause of brachycephaly.

The evidence then, as far as it goes, points to the same conclusion as that to which we came as regards pigmentation, and it may eventually be proved that just as each area has its own type of coloration, so also has it its own osteological character. In support of this I may point out that recently Dr. William Wright, Hunterian lecturer, has come to the conclusion from his craniological investigations that the brachycephalic Alpine race was evolved on European soil, whilst Dr. C. S. Myers has been led by his researches on Egyptian skulls to conclude that, "in spite of the various infiltrations of foreign blood in the past, modern Egypt contains a homogeneous population which gradually shifts its average character as we proceed southwards from the shores of the Mediterranean to Nubia beyond the first cataract."

It is not impossible that Alpine environment may have acted upon the shape of the skull of the ox as well as that of man. We know from the examination of the fauna of the lake dwellings of Switzerland that the Celtic ox (*Bos longifrons*) was there the common type, and its descendants still continue to be the typical breed along the Alpine chain. This ox is characterized by its strongly developed occipital region and its small horns curved forward and inward. As it differs so essentially from the urus (*Bos primigenius*) and from the long-horned cattle of the Mediterranean lands, it seems not unlikely that the peculiar cranial formation may have been evolved under mountainous environment.

## REVIEWS.

## EUROPE.

## THE BRITISH COASTS.

'Royal Commission on Coast Erosion,' vol. 1 (part ii.). London: Wyman & Sons. 1907. Price 8s. 9d.

MUCH of the evidence before the Commission deals with the legal aspect of shore and foreshore rights, the desirability of establishing a central authority to deal with coast defence, the allocation of the expenses of defence works, the possibility of utilizing the unemployed upon extensive reclamation works, and other matters of little geographical interest. In addition to their verbal evidence, monographs dealing with coast erosion in general were put in by Mr. W. Whitaker and Mr. Clement Reid, together with papers by Messrs. Whitaker, Reid, Mellard Reade, and other experts, upon the sections of the coast of England and Wales of which they have personal knowledge.

Answers to certain questions were also sent in by the local authorities of all parishes possessing a seaboard. Their opinion is almost unanimous that no areas exist whose reclamation would be profitable. They differ widely as to whether any erosion can be directly traced to the removal of beach materials, some thirty answering this question in the negative, and forty in the affirmative. The explanation lies in the fact that the shingle, which is undoubtedly protective, is renewed in certain places, but not in others, by the natural drift. In Devonshire, where the pebble beaches are not derived from erosion *in situ*, and have no present recruiting ground, their removal has been particularly disastrous. The checking of the shingle drift by the construction of very high and very long groynes has also frequently led to erosion further along the shore. In one case increased erosion is traced to an order prohibiting the removal of gravel; here the destructive power of the waves was increased by the pebbles which they dashed against the cliff.

In Yorkshire, Lincolnshire, Norfolk, Suffolk, and Essex, "faggotting" the sand dunes, and planting them with marrum grass, sea-buckthorn, and tamarisk, has been very successful in checking encroachment, while in Lord Leicester's Norfolk estate, plantations of *Pinus maritima* have been employed to prevent the advance inland of blown sand.

Much difference of opinion was expressed by witnesses as to whether shingle drift is due primarily to waves or to currents; the general sense of the drift is, however, in the direction of the tidal waves. Many witnesses asserted that shingle can travel below low water mark at a depth of 10 fathoms or more, and that beaches are therefore renewable from the sea; but evidence obtained indirectly from the Marine Biological Association seems to show that no material from below 4 fathoms ever reaches the shore. The accretion of the north coast of Lincolnshire and of Dungeness is, however, cited as proving that travel at depths greater than 10 fathoms must take place.

A table of statistics, showing gains and losses of shore and foreshore during recent years, is put in by Colonel Hellard, of the Ordnance Survey Department. For the whole of the British isles the net gain above high-water line is 41,362 acres, and the net loss of foreshore 37,074 acres. These figures are not, however, quite exact, as, in the case of seventeen counties, the original surveys were made at spring tides, the later at ordinary tides. Colonel Hellard notes the erosion going on between Bridlington and Spurn Head as the most serious in the country.

The history of the defence of Southwold during the last seventy-eight years,

involving the expenditure of some £22,000 of public money, much of which has been literally thrown away, coupled with the conflicting opinions expressed by members of the Institute of Civil Engineers on many important points, shows how great is the need of further experimental research upon subjects connected with coast erosion, such as that recently undertaken by Dr. J. S. Owens.

E. T.

#### THE ALPS.

'The Alps in Nature and History.' By W. A. B. Coolidge. London: Methuen & Co. 1908. *Price 7s. 6d. net.*

On too many of the illustrated volumes which pour singly, or in series, from the modern press, the comment of the judicious reader is likely to be summarized in the old adage, "A little knowledge is a dangerous thing." They are, in fact, what painters call "potboilers," productions whose primary object is to bring in a pittance to the compiler and a profit to the publisher. Their writers, being no experts in the subjects dealt with, prefer to borrow at second or third hand from their recent predecessors rather than to consult original authorities. Lacking familiarity, personal or literary, with their theme, they are apt to fall into errors, or, if they escape these, to present facts in a novel and strangely disproportionate aspect.

No one will accuse Mr. Coolidge's work on the Alps of belonging to this class. His chief impediment in the satisfactory execution of his task has been, not too little, but too much knowledge. His qualifications are his danger, if not his defect. He has a many-sided and unique practical and literary acquaintance with the Alps and the Alpine people—geographical, historical, social. He has probably climbed and traversed more of their peaks and passes than any living man; he has lived for twelve years in their heart. Consequently his pages are a minutely tessellated pavement of facts, and some of the chapters may be found better adapted for use as a work of reference than for light reading. It would, perhaps, have been wiser to divide his overflowing material into two separate works, and to have adopted a less summary treatment in his outlines of local history. We should gladly have seen the chapters on "The Political History of the Alps" and "The Great Historical Passes" expanded to double their length, and a second volume devoted to the "Natural Aspects of the Alps and the Story of their Exploration and Conquest." But there are, no doubt, compensating advantages in having so much information condensed in a single volume, and made available by an excellent index.

The reader will find here an account of the Alps in their physical aspects, of their relationship to mankind and to their own inhabitants, of their political history, and of the many minute vicissitudes in their territorial divisions. As might be expected from an explorer so seasoned and sedulous, their groups and summits are described in detail, lists are given of the heights of the principal peaks and passes with the dates of first ascents, preceded by a brief sketch of the work done by the pioneers who opened a path to conquest for the climbers of the second half of the nineteenth century. Every page bears witness to the accumulation in the author's brain of stores of knowledge drawn from remote and rare historical sources as well as from standard works. Equally industrious as a climber and a scholar, there is hardly a glen in the Alps or a tract dealing with their story with which Mr. Coolidge is not familiar. Sitting in the centre of a well-filled library he is ready to account for irregularities of frontier, such as, for instance, those found in the Venetian Alps, or to explain the reasons for the rise and fall at various periods of the great passes.

There is no want of variety in our author's wallet. Within a few pages we

read how a great guide led him down into a crevasse, and along its bottom, where he actually saw *in situ* the rock-bed being smoothed and grooved by the fragments of harder rock carried in the ice. We are told of a feudal tenure by which the inhabitants of certain villages were bound to cover with earth a glacier in Val d'Ayas, so that the shining snow might not injure the complexions of the fair ladies of the house of Challant. We learn the variations in the legal title to glaciers in different regions. Political geography is dealt with in great detail, and the student may follow every change in the ownership of the Alpine districts, and trace the events that have given them to their present masters, in many cases causing political frontiers to diverge widely from water-partings. On such subjects what our author knows not is not knowledge. Yet we would venture to suggest that in one or two matters of detail another point of view than his may be admissible.

Mr. Coolidge, while allowing that to the Alpine people "The Alps" are the upland summer pastures (he might have added that the tops of the Tuscan Apennines are called "Alpi" from serving the same purpose), would confine the literary use of the term to the part of the range "lofty enough to bear considerable masses of perpetual snow" (p. 286). Acting on this principle, he makes the Col di Tenda—Mr. Coolidge uses the French *de* with the Italian *Tenda*—and the Radstadter Tauern the western and eastern limits of his survey. This, though we are aware that Mr. Coolidge may allege influential supporters, amongst them Broekedon and Ball, seems rather a climber's than a geographical division. We might appeal to the excellent map supplied by Mr. Bartholomew to this volume for confirmation of our preference of the Col d'Altare and the line of the railway from Linz to Leoben. We also venture to object to the exclusion of the "Alpis Maritima," the road over the neck of Turbia, from the historical passes of the Alps, and the inclusion among them of the Col di Tenda, on the simple ground that the former crosses the "main divide," while by crossing the Col di Tenda one does not pass the Alps in the ordinary sense of the phrase. Again, we find it impossible to agree with Mr. Coolidge's repeated assertion (pp. 153, 161, 163) that the Mont Cenis was in early times free from the "topographical drawback," in the case of a traveller coming from Central France, of a preliminary hill. The ordinary route to the Mont Cenis lay over one of the gaps in the Mont du Chat, above the Lake of Bourget, a passage not without difficulty before Napoleon improved the road. The alleged advantage of the Mont Cenis over the Mont Genève and the Col de l'Argentière in this respect is, we think, imaginary; its real advantage is in distance.

Turning to the more human side of the text, we feel that, by his decision to omit the share in Alpine exploration of all living climbers, Mr. Coolidge has left his record incomplete. He may at least claim, however—since he omits, as a rule, his own ubiquitous exploits—that he has acted impartially in this respect. An endeavour that has recently been made to assign a particular omission to a personal motive was unworthy of a serious critic.

We should add that wherever Mr. Coolidge has room to introduce the personal touch he does so with skill and effect. Witness his account of the pioneers among guides, his references to guideless mountaineering, or his sketch of the neglected Maritime Alps with their superb panoramas of sea and land, extending from the Iles d'Hyères to the Gulf of Spezzia, from Monte Rosa and the Disgrazia to Monte Cinto in Corsica; or, again, the few pages bearing the title "A Year's Round in the Alps," which describe the flowers of mid-June and the tints of October.

Mr. Yeld has contributed a very pleasant chapter on the flora of the High Alps, while Mr. Howard Knox deals with their beasts and birds. The proofs have been very carefully revised, and in the mass of local names and figures we have only

detected two trivial misprints. But may not "Mons Elvelinus" (p. 176), given as an old name for the St. Gotthard, be a misreading for "Mons Elveticus"?

The book is illustrated by admirable photographs (inserted somewhat promiscuously as regards the text) of the peaks and glaciers of the High Alps, taken mostly in unfamiliar aspects. Many of these views would serve well for an educational series of slides illustrating the phenomena of the region above the snow-level. They are a welcome variety to the vague and smudgy prettiness of the coloured plates now in fashion for book illustration. Some outline maps will help the historical student.

D. W. F.

## ASIA.

### HIGH ASIA.

'A Sketch of the Geography and Geology of the Himalaya Mountains and Tibet.' Parts I., II., and III. By Colonel S. G. Burrard, B.E., F.R.S., Superintendent Trigonometrical Surveys; and H. H. Hayden, B.A., F.G.S., Superintendent Geological Survey of India. Price 6 Rs.

The topographical features of the Earth's surface have exercised such a powerful influence on the destiny of nations and peoples, that any description of them, or attempt to explain their origin, cannot fail to be of absorbing interest. This interest is largely enhanced when descriptions are as lucid as those we find in these papers. The immense mountain ranges which form the northern and, in a lesser degree, the north-western, frontiers of India, are topographical features which have produced a marked effect on the history of this great peninsula. They have completely cut off and separated India from all communication with Central Asia towards the north, and confined it to a comparatively few well-defined routes on the north-west and north-east. Hence every conqueror, except those who came by sea, has been obliged to select one of these routes. But apart from any historic influence the Himalaya ranges may have had, they are, in themselves, full of interest. The grand scale on which these mountains are built, their immense height and inaccessibility, all tend to inflame the imagination and excite curiosity.

The papers before us are divided into three parts dealing chiefly with the geography of the region, while a fourth part, not yet published, is to be devoted exclusively to geology. Questions relating to geography and geodesy are dealt with by Colonel Burrard, while the geological portions are by Mr. H. H. Hayden.

In Part I. Colonel Burrard discusses at length the heights of the great peaks, the errors the published determinations are liable to, and the difficulties which beset the surveyor in the measurement of the heights of inaccessible objects, owing to the many uncertainties inseparable from the operation. He has classified under five groups seventy-five great peaks, which attain a height of 24,000 feet and over. He considers and deduces reasons for supposing that "there is little probability now of a higher peak than Mount Everest being discovered, and even the prospect of finding a new peak of 27,000 or 28,000 feet is becoming remote." Though Mount Everest is the highest mountain in the world, perhaps Nanga Parbat, in the Punjab Himalaya, is the most imposing. It attains a height of 26,620 feet, 23,120 of which are exposed to the eye of the observer. It is, as Colonel Tanner remarks, "one of the grandest spectacles nature offers to the gaze of man."

A very interesting and scientifically treated section is devoted to the errors of the adopted values of heights. The principal sources of error are due to deviation of gravity or local attraction of the range, which affects the datum from which altitudes are measured, and the difficulty of determining the correct coefficient of refraction suitable for rays traversing extreme varieties of atmospheric

conditions in passing over great distances. The latter produces the greater effect on the results. In the case of Mount Everest, which has been worked out in detail, it would appear that when the station of observation is situated in the hills a coefficient of 0.05, and when in the plains 0.0645, gives the best results. From these Colonel Burrard deduces the most probable value for the height of Mount Everest as 29,141 feet, or 139 feet greater than the accepted value of 29,032. No doubt the higher value would have been adopted had we known as much about refraction when it was first measured as we do now. The latest value, however, omits the effect of the deviation of gravity (which might make the mountain some 60 feet higher), of which our knowledge is as yet imperfect. The method adopted of treating the question of refraction is certainly most interesting, and might with advantage be applied to the computations of future heights where reciprocal angles cannot be measured. It is to be hoped that opportunities will arise, and facilities be given, for extending our knowledge of local attraction by observations over as large an area as possible. We shall then be in a position to compute its effect on apparent angles of elevation.

The last section of this part is on the geology of the great peaks by Mr. Hayden. As far as can be ascertained they are composed of granite, gneiss, and associated crystalline rocks. Specimens of these rocks are fairly common in the beds of some of the great Himalayan rivers; they have even, in the case of the Jumna, been carried as far as the plains. Though for want of positive knowledge it is not quite certain that all the great peaks are composed of granite, yet such widely separated mountains as Kichinjunga and Nanga Parbat are known to be so. Indeed, it is probable that the groups of high peaks are situated on a more or less continuous axis of granitic material, which during the development of the Himalaya as a mighty mountain range "welled up from below, forcing its way through, and lifting up, the pre-existing rocks." It is probable that their present great height is largely due to the power of the material of which they are composed to resist weathering, especially when it is protected by a mantle of everlasting snow.

Part II., dealing with the principal mountain ranges of Asia, opens with an article by Mr. Hayden, on the origin of mountain ranges. They appear to have been formed by a great horizontal thrust in the earth's crust coming from the north. Many theories have been advanced to explain this complex subject. The author selects three hypotheses as the most important—(1) Contraction of the Earth; (2) disturbance of isostasy; (3) change of the rate of the Earth's rotation. It may, perhaps, be that mountain ranges are produced by a combination of all these causes, which may have been slowly at work through countless ages, and probably still are in operation.

The question of local attraction causing the deviation of the plumb-line, which has already been referred to, is dealt with in more detail in the next section by Colonel Burrard. It has been known for some time that the attractive effect of the Himalaya diminishes much more rapidly, as the plains of India are entered in a southerly direction, than can be accounted for on purely theoretical considerations. For instance, the northerly deflection at Dehra Dun is 37", while it is almost zero at Kaliana, situated in the plains 55 miles to the south. On a basis of 37" at Dehra Dun, there should be, theoretically, a deflection of 18" at Kaliana. Though the matter had been dealt with by Archdeacon Pratt we believe Colonel Burrard is the first to explain, in a satisfactory manner, the cause of this divergence of theory from practice. It can be explained by supposing the existence, south of Kaliana, of a chain of very dense material almost parallel to the Himalaya, buried in the earth's crust, the attraction of which produces a deviation in the opposite direction to that of the visible mountains. At Kaliana these two attractions are almost equal and

in opposite directions. Major Lennox Conyngham's pendulum observations have confirmed the existence of this dense mass, originally suggested by the known deviations of the plumb-line.

To the map-maker the question of how best to show mountain ranges where great differences of height occur, is one of the utmost importance. Perhaps a solution of this problem is to be found in the employment of the layer system of representing heights by different colour tints. If the colour scale be suitably selected, this method can be made to give most effective results. It also has the advantage of leaving nothing to the imagination of the draftsman.

Part III. is devoted to a detailed description of the rivers of the Himalaya and Tibet, with, in many instances, an historical sketch of their exploration. This is interesting as showing the curious mistakes made by early explorers, as in the case of the source of the Ganges. But such mistakes are perhaps excusable when one considers the hopeless entanglement these mountains must have presented to the traveller before the days of maps. One thing strikes the reader that, notwithstanding the area already mapped and explored, there still remain large tracts the topography of which is uncertain. There is yet work here for the Survey of India, and for the enterprising traveller.

Many of the Himalayan rivers have such steep gradients that there must be immense water power, comparatively close to the densely populated plains of India. These still await investigation with a view to determining how far they could be used for the transmission of electrical power for economic purposes. This is a matter in which the Government of India might, with advantage, follow the example of the United States, where natural sources of power are officially investigated.

Systematic measurements have recently been begun, at the request of the International Committee for the Study of Glaciers, by the Geological Survey of several glaciers in different districts, to determine glacial movements of advance and retreat. Marks have been laid down, plans made, and photographs taken of the state of affairs at the date of observation. It is hoped that travellers and sportsmen visiting the glaciers will assist in this work. Information on the subject can be obtained from the Director, Geological Survey, Calcutta.

We must refer the student who wishes to study this interesting area to the papers themselves. An immense amount of literature has been consulted in their preparation. They are profusely illustrated by charts and plans. The papers are published by order of the Indian Government.

H. L. C.

#### TWO GUIDES TO CEYLON.

'The Book of Ceylon.' By Henry W. Cave. London: Cassell. 1908. Pp. xiv. and 664. *Maps and Illustrations.* Price 12s. net.

'Ceylon: A Handbook for the Resident and the Traveller.' By J. C. Willis. Colombo: Colombo Apothecaries Co.; London: Dulau. 1907. Pp. x. (unnumbered), 247, and iv. *Maps and Illustrations.*

Each of these books is of a character which should ensure a welcome from geographers, and particularly from those interested in the geography of the Empire, for there are not too many such works on its component parts. Mr. Cave's name is already well known in connection with books concerning the island from particular points of view. In 'Golden Tips' he dealt mainly with the tea industry; in 'The Ruined Cities of Ceylon' with a very different subject; in fact, his varied interests prove him to be well equipped for the production of such a work

on the island as that now before us—"an account of its varied attractions for the visitor and tourist," to quote the sub-title. The reader will find that he is first introduced to the geography, climate, and history of Ceylon in general terms, and the system of government is briefly touched upon. He is then led through the island in various directions, the railway lines providing the groundwork for the routes. The descriptions of every site and scene of interest are clear and concise, while avoiding that concentration in style typical of the ordinary guide-book, which makes against literary pretensions. Marginal headings afford a running analysis of the paragraphs. This is a useful feature; but the index does not appear to be satisfactory; at any rate, there is a certain number of entries in it of that usual but valueless type which does not represent a subject which a reader could be expected to look up. There is a short but valuable appendix of information necessary to visitors. But perhaps the most notable feature of the book is the vast number of photographic illustrations. These interleave every page of text, and are often very beautiful, and always finely reproduced, though a few suffer from being reduced too small for their subjects. There is one other objection to them: the heavy paper on which they must be printed makes the book irksome to hold.

Mr. Willis's book would be that chosen, of the two, as an introduction to a serious geographical study of Ceylon. In style and arrangement it is laid out on somewhat more formal lines, the whole work being divided by subjects, not "according to itineraries." The first part deals with geology and geography, products, climate, zoology, botany, agriculture, and forests (on which the author, as director of the royal botanical garden at Peradeniya, writes with more than usual authority). We have next history, ethnology, and archæology, then a descriptive section, including an alphabetical gazetteer of chief towns, villages, etc., excellently carried out in a small compass, a section on sport, and a miscellaneous section, including a glossary and bibliography. This brief synopsis shows the book to be a true work of general reference for Ceylon, and, being fairly mapped and illustrated, it could hardly be improved upon in design.

## AFRICA.

### CYRENAICA.

'Cirene e Cartagini.' By G. de Martino. *Illustrated.* Pp. 198. Bologna: Zanichelli. 1908. Price 6s.

If this prettily illustrated book cannot be said to add much to our geographical knowledge, it is welcome for more than one reason. It gives an *interim* report on the actual political state of the strangely inaccessible Cyrenaic region, and throws a good deal of light on the policy by which Italy, the most interested of the European powers, proposes to reduce that inaccessibility. It therefore bears directly on the future of geographical exploration in a hardly known corner of Africa. Signor de Martino, a senator of the Kingdom of Italy and president of the Italian Colonial Institute, made his way from Derna to Bengazi by the usual over-land route, with a *détour* from Guba to Marsa Susa. He was wise to enter at the back door, so to speak, for, had he gone round to the front, i.e. to Bengazi, he would almost certainly have got no further inland. Even as it was he had to use guile, and pose as a travelling buyer of skins—the trade of his two companions, Italian residents at Derna. It would have been better had he prepared himself for the trip by getting up the literature of previous travel—he shows either very inaccurate knowledge or no knowledge at all of his immediate European predecessors—but he could use his eyes, and he looked sanely and thoroughly at what he saw. It would seem as if Ottoman rule in Cyrenaica had experienced somewhat of a set back of late. Signor

de Martino found its effective control limited to a few garrisoned ports and the rest of the country defiant. At Cyrene itself he was treated with suspicion, and strongly advised to make himself scarce; but he came to no harm, his companions being favourably known to the tribes. He saw great possibilities in the country, but an actual state of deplorable neglect and disafforestation. Of places where the Ottoman rule prevails he gives a bad account. But he deprecates Italian political interference, and recommends a policy of peaceful penetration. By the way, he states some curious facts about Egyptian action in this region: the frontier seems singularly indefinite. On a possible future for the port of Tebruk he rightly insists.

The part of his book devoted to Tripoli and Tunisia is of less interest, and very superficial. He uses the little he saw of his latter country chiefly as an ensample to his countrymen. If France can do what she has done in the old territory of Carthage, why not Italy in that of Cyrene? But this is hardly consistent with peaceful penetration!

D. G. H.

## AMERICA.

### THE HISTORY OF THE NIAGARA FALLS.

J. W. W. Spencer. "The Falls of Niagara, Their Evolution and Varying Relations to the Great Lakes; Characteristics of the Power and the Effects of its Diversion." Geological Survey of Canada. Ottawa, 1907, xxxi. + 490 pp. *Plates and Maps.*

The written history of Niagara dates from the visit of Hennepin in 1678. The position of the falls at that date can be inferred from his description, and the rate at which the falls have been cut backward during the past 230 years can therefore be determined. Niagara, accordingly, is an instructive example of the rate of river erosion, and, as the falls must have come into being at the end of the glacial period, they supply a means of estimating the length in years of post-glacial time, for the locality of Niagara. The first important estimate was that by Lyell, in 1835, who assigned Niagara a part-life of 35,000 years. The date has since been re-calculated several times, by geologists with much fuller data than were available to Lyell. The problem does not admit of simple solution, owing to the complexity of the physical geography of the country and its river system. Lyell explained the whirlpool below the Niagara rapids as due to a former river channel, now filled by soft drifts, which are more easily worn away than the harder rocks of the old river banks. The presence of such an ancient gorge along the present course of the river would have so greatly facilitated the formation of the existing canyon that Lyell's estimate of the time necessary may be greatly reduced.

Modern studies of the geology of the area have continually added to the complexity of the problem, and the Geological Survey of Canada is to be congratulated on the important monograph by Dr. Spencer, in which he summarizes the available evidence, and makes several important additions to the known facts. The new information in this work includes the results of a series of borings, as originally suggested by Prof. H. S. Williams, to determine the cause of the buried river channel exposed at the whirlpool. The second important contribution is the survey of the Niagara river below the falls, by a course of difficult and dangerous soundings. This work has shown the existence, immediately below the falls, of a basin 192 feet deep. Further down-stream, at the cantilever bridge, the channel shallows to only 86 feet, owing to the accumulation of limestone boulders that have fallen into the river from the sides of the gorge. When the falls were at that position the depth of the river channel below them was as deep as it now is further up-stream.

The rate of recession of the falls is now well established. The retreat has been

proved by careful surveys between 1842 and 1905, and the mean retreat during those 63 years has been 4·2 feet per annum, while 7½ acres of the river channel above the falls has been worn away during that period.

Lyell's estimate has been reduced until Dr. G. K. Gilbert allows the falls a past life of only 7000 years, and a future of some 3500 or 5000 years. This prediction is based on the assumed tilting of the area of the great lakes, which would, if continued, divert the drainage from the St. Lawrence into the Mississippi. Dr. Spencer rejects both Gilbert's conclusions. He even exceeds Lyell's estimate, as he assigns the falls a past of 39,000 years, and promises them a long future unless all their water be diverted for the sake of electric power. The factors that add to the antiquity of Niagara include the great increase in the height of the falls and in the volume of the water. At first the Niagara river plunged directly into Lake Ontario, as that lake was then standing at the level of its highest beaches; the falls were only 35 feet high. Moreover, the volume of the river was only 15 per cent. of the present amount, for at that time the drainage of the great lakes was discharged from Lake Huron into the valley of the Ottawa river. Earth-movements closed this outlet, and for a while the great lakes overflowed from Lake Michigan across the divide near Chicago into the Mississippi, and at another time their outlet was from the southern end of Lake Huron into Lake Ontario. Finally, during these complicated changes in the river systems, Lake Huron flooded the valley which is now occupied by Lake St. Clair and the Detroit river, and reversing the direction of the rivers there, overflowed into Lake Erie. The Niagara river thus received all the waters discharged by the great lakes, except Lake Ontario.

The history of the Niagara river is, therefore, unusually complex, but Dr. Spencer has the most engaging faith in the certainty of his estimates. He calculates that the falls were opposite the whirlpool 3000 years ago, and the overflow from Lake Michigan into the Mississippi happened from 2000 to 2500 years since.

Another important geographical problem connected with the Niagara question is the still-continued tilting of the area around the great lakes, which, according to Dr. G. K. Gilbert, is still in progress, and will drain Niagara some 3000 years hence. Dr. Spencer, however, maintains that the area in question is quite stable, and that it has not moved in recent times. The earth-movements in this region were confined to the north-east of Lake Ontario, and the supposed recent changes in the shores of Lake Michigan he attributes to local meteorological causes. Dr. Spencer discusses whether the admitted tilting to the north-east of the great lakes be an isostatic effect due to the retreat of the ice; he, however, rejects this view, and prefers the explanation of the Rev. O. Fisher that the movement was caused by a flow of material in the fluid sub-stratum of the Earth.

The Geological Survey of Canada is to be congratulated on this valuable contribution to an important geographical question, but we regret that such a work should have been made the medium for a series of accusations against one of the most distinguished of American geographers.

## GENERAL.

### ETHNOGRAPHY.

'The World's Peoples: A popular account of their bodily and mental characters, beliefs, traditions, political and social institutions.' By A. H. Keane, LL.D., F.R.A.S. London: Hutchinson. 1908. 8 x 5, pp. 429. Price 6s.

Dr. Keane's work as an anthropologist is well known and justly valued, and he has done good service to the science in writing this popular account of the peoples of the world, the price of which should put it well within the reach of every one,

and it should serve to stimulate an interest in this, the most fascinating of all the sciences.

After an introductory chapter on the human family, in which the theories of monogenesis and polygenesis are discussed, and a general sketch setting out the general characters of the different peoples, Dr. Keane proceeds to deal with each division separately. Thus, there are chapters on the Oceanic Negros and Negritos, the African Negros and Negritos, the Mongols, the Amerindians, and the Caucasian or White division, in which the author places the Polynesians, which many anthropologists consider open to grave doubt, or at least not proven. In each section, besides a description of the physical characters of the people, which is wisely brief, Dr. Keane gives an account of their religion, folklore, and institutions.

A great feature has been made of the illustrations, which are all taken from photographs and show a marked advance on those figuring in other works of a similar nature. They more than adequately illustrate the text, and are alone worth the price asked for the book. But where the illustrations are so good it is a pity that the publishers could not have seen their way to add a few maps. These, if only in outline, would have been a great help to the reader, who has not always an atlas handy, and where he has, would not find a tithe of the tribes marked. It would also be an advantage if, in subsequent editions, short bibliographies of the more important works could be added at the end of each section.

The size of the book naturally necessitates that it should be merely a sketch (details cannot be entered into in four hundred pages, about a third of which is taken up with pictures), but should it inspire its readers to go more fully into the subject, as it surely should, it will have more than done its work.

### SHORT NOTICES.

*Europe.*—‘The Land’s End.’ By W. H. Hudson. (London: Hutchinson. 1908. Pp. viii., 323. *Illustrations*. 10s. 6d. *net*.) For a book so strictly local and personal in interest this is something lacking in distinction of style or matter. But that is not to deny that it forms very pleasant reading, and will interest the many lovers of Cornwall, particularly as it gives impressions of the western peninsula in winter, a season when it is not known to most of them. The topographical interest, however, is subordinate to that of the naturalist, the book dealing primarily with the habits of birds. The wash and line drawings by Mr. A. L. Collins are executed with taste, and well reproduced.

‘Through Finland to St. Petersburg.’ By A. Maccallum Scott. (London: Grant Richards. 1908. Pp. x., 287. *Map and Illustr.* 2s. 6d. *net*.) This is a very successful attempt to combine the value of a guide to travellers with literary attraction. Its descriptions are clearly phrased; its photographs in most cases beautiful. It deals with the more frequented parts of a country which has attracted much recent attention for political reasons, and is probably visited by an increasing number of tourists; for it is difficult to follow the author in his assertion that “the average British reader still . . . thinks of [Finland] as a snowy waste where the few fur-clad inhabitants contrive to prolong their existence on whale blubber.” In fact, the first paragraph of the preface (from which the above words are quoted) is the only obvious flaw in the book, save that the map is supremely oblivious of orthography.

‘Castles and Chateaux of Old Navarre.’ By Francis Miltoun. (London: Pitman. 1908. Pp. xvii., 456. *Maps and Illustrations*. 7s. 6d.) The writer ranges both sides of the Pyrenees, covering, according to the sub-title, the Basque Provinces, Foix, Roussillon, and Béarn. The text shows not only literary ability, but erudition in many directions, so as to make the book of much higher value than a mere

record of impressions. This was indeed to be expected from the writer's previous works of the same character. The book is excellently produced at the price. The illustrations suffer in some instances from an exaggerated style of colour and representation of topographical features, but where they are free of this fault they are admirable. The book may be commended alike to those who know the Pyrenees and those who intend to do so.

'Through Savage Europe.' By Harry De Windt. (London: Fisher Unwin. 1908. Pp. 300. *Illustrations*. 10s. 6d. net.) The author bases this book on travels through the Balkan States and European Russia. The title indicates a certain tendency towards the sensational, and the book is not wholly free of the same tone. It is interesting for leisure reading, and though it is without distinction on the whole, full justice is done to those points of interest which would most readily strike the traveller in Mr. de Windt's path. Among many excellent photographs, special notice may be taken of several fine bird's-eye views of towns visited.

'The Early History of the Levant Company.' By M. Epstein. (London: Routledge. 1908. Pp. x. and 270. 2s. 6d. net.) This is a very interesting compilation, tracing the history of the Company from its first incorporation in 1592 down to 1640, and also dealing with the circumstances and the earlier companies which preceded its foundation. Material hitherto unprinted has been largely drawn on, and is moreover quoted at length, and in arrangement and the careful method of reference to authorities the book gives every evidence of scholarly work. It might with advantage have been briefly indexed.

*Asia*.—'Persia: the Awakening East.' By W. P. Cresson. (Philadelphia: Lippincott. 1908. Pp. 275. *Illustrations*. \$3.50 net.) The internal political circumstances of Persia have been lately in such rapid motion that it is already necessary to read Mr. Cresson's experiences (from this aspect) in a new light. This, in a sense, detracts from their interest, and, on the other hand, the awakening of Persia has not yet brought the country to the point of development when it begins to possess new geographical interests apart from the work of actual exploration. This book has, perhaps, therefore, been written at an unfortunate moment, but it is well written.

## THE MONTHLY RECORD.

### EUROPE.

**Temperature and Altitude in Switzerland.**—The vertical distribution of temperature in the Eastern Alps was dealt with in a masterly manner by Dr. J. Hann some twenty years ago, but a similar study for the Swiss Alps as a whole has hitherto been a desideratum. It has lately been undertaken by Dr. J. Maurer, director of the Swiss Meteorological Office, who has given the broad results, with a brief indication of the methods adopted, in the June number of the *Meteorologische Zeitschrift* for 1908. In order to supply a basis of comparison with Dr. Hann's results, Dr. Maurer has, like the latter, combined the various series of temperature means available for the purpose by the method of least squares, arranging the data in groups corresponding with the main climatic regions into which the Swiss Alps may be divided. The results are shown in a table, in which the decrease in temperature for every 100 metres is given for each month of the year in the several climatic regions (Jura, Northern Slope of the Alps, Eastern Swiss Alps, Southern Slope, Valais). Another table shows the general results obtained by Hann for the eastern Alps side by side with Dr. Maurer's figures, a comparison

being in each case made between the northern and southern slopes of the range; and the general agreement is most satisfactory. On the northern slope, the mean yearly decrease per 100 metres works out as  $0.507^{\circ}\text{C}$ . ( $0.907^{\circ}\text{Fahr.}$ ) in the case of the Eastern, and as  $0.510^{\circ}$  in the case of the Swiss Alps. Dr. Maurer proceeds to compare the observed with the calculated temperatures for the various levels in Northern and Southern Switzerland and in the Valais respectively, with instructive results. In Northern Switzerland the actual temperatures from 900 to 1300 metres appear throughout too warm, and in spring and summer this excess reaches up to 1700 metres. In the south these conditions come out still more markedly for all the seasons. Lastly, special instances are given of exceptional local deviations of the actual from the theoretical temperatures, the cases of most marked excess of the former occurring in the Föhn districts on the northern side and at stations with specially warm exposures.

**Sebastian Münster's Map of Germany of 1525.**—In *Globus* (vol. 94, No. 1) is to be found, along with a descriptive article on the subject by Dr. A. Wolkenhauer, an excellent photographic reproduction, half size, of Sebastian Münster's long-missing map of Germany published in 1525. Among the maps of Germany most widely circulated in the sixteenth century was Münster's woodcut map, included from 1540 in his editions of Ptolemy, and from 1544 in the very numerous editions of his 'Cosmographia.' Till recently, however, there was lost to geography the considerably better single map of Germany above referred to, constituting the main part of Münster's 'Instrument der Sonnen' published in 1525. The popularity of this latter map is witnessed by the fact that an explanatory booklet went through many editions, a new and somewhat altered impression appearing in 1579. At length, after having been so long sought after, a copy was in 1907 produced at the sixteenth German Geographentag at Nuremberg—a coloured woodcut, 28 by  $17\frac{1}{2}$  inches, containing, besides the map in its centre, astronomical figures and a table of places. The sheet is entitled 'Eyn New lüstig und kurzweilig Instrument der Sonnen, mit yngesetzter Landtafel Teütscher nation,' and is dedicated to Graf Georg of Wertheim. The above-mentioned booklet, now rare, was published at Oppenheim in 1528. The sheet exhibited—the only known copy at the time—is the property of the Nuremberg Library. Since then, however, Dr. Wolkenhauer has made acquaintance with a second copy belonging to the Basel University Library, and from this copy the photographic reproduction is taken. The second part of the explanatory booklet earnestly invites special maps and reports, in order to the production of a full description of Germany planned by Münster. It recommends also the cartographic delineation of the environs of towns as illustrated by a map of the environs of Heidelberg. Besides the circular map in the centre of the sheet, there are four corner circles of astronomic or astrological import, called for by the fashion of the times, and entitled—(1) diurnal, (2) nocturnal, (3) circle of date, (4) circle of rising signs. Flanking the plate to right and to left are diagrams of solar eclipses, etc. Dr. Wolkenhauer makes some interesting remarks on the sources and contents of the map, which is the earliest map of Germany to show the course of the Rhine with an approach to accuracy. He has lately unearthed in the Munich library a manuscript notebook of Münster's, dating from 1515, which, besides copies of other maps of Germany, contains sketches of the course of the Rhine.

**The Southern Carpathians.**—We have already referred briefly to Prof. de Martonne's monograph on the Southern Carpathians, published in vol. 1 of the new series of the *Revue de Géographie*. A somewhat fuller analysis may be given here. The main problems considered are (1) the abrupt changes of direction of the Carpathians; (2) the peculiar aspect of the Carpathian summits; (3) the character

of the Oltenian depressions; (4) the transverse courses of the Jiu and Oltu; (5) the glaciation of the Carpathians. The first problem disappears when we consider that the history of the regions west and east of the Prahova is entirely different. To the west of this river the predominant forms are two series of metamorphosed Palaeozoic schists, accompanied by eruptive rocks and Mesozoic limestones, some of which are also metamorphosed. The whole region was vigorously folded and dislocated during Mesozoic times, as is shown by the fact that the Palaeozoic schists overlie the Mesozoic. Its subsequent movements have been entirely epirogenic, with the exception of local folding and faulting in the Tertiary basins. In this region the lines of relief are in striking discord with the structural and tectonic features. East of the Prahova the chief formations are cretaceous and Palaeogenic flysch, with molasse. The region was folded regularly in Tertiary times, and forms a mountain system of the Jura type, in which relief and structure are harmonious. The Carpathian summits, especially in the Banat and Transylvanian massifs, whether formed of limestone, granite, or schist, are strikingly uniform in their general appearance, which is that of advanced maturity; in this they contrast with the valleys, which display all the characteristics of youth. These summits form a platform of a general level of 1800–2000 metres, which is clearly an old uplifted peneplain. The author calls it the Boreas platform, after the district in which it is best developed; he assigns it probably to the Upper Cretaceous. An examination of the relief showed the remains of a second platform, that of Riu Săs, which had reached maturity during the Miocene, and a third, that of Gornovitza, active erosion of which is still going on. The Riu Săs platform underwent considerable warping and flexure, and its general level is not constant; the Gornovitza platform averages 400–800 metres, except in the Petrosheni basin, while its altitude is 900–1100 metres. Thus the region has been subjected to a series of uplifts *en masse*, and during the successive cycles of erosion all relation between relief and structure has been destroyed. A series of basins aligned from west to east lies between the Southern Carpathians and the Valakhian hills. These are formed by a synclinal fold, and their general correspondence with the extent of the calciferous deposits of the second Mediterranean stage shows them to have been already sketched out in the Miocene. At the end of the Pliocene they attained maturity, forming part of the Gornovitza platform; their drainage was then longitudinal; subsequent orogenic movements caused the capture of their streams by the headwaters of the rivers of the southern hills. Maturity was again reached, but still later movements during the pleistocene caused an uplift of the whole sub-Carpathian region with the exception of the depression west of the Gilortu, *i.e.* Tismana and Targu Jiu. The Mehidinți and Miroci plateaux lying respectively north and south of the Danube gorge are one from the point of view of both structure and relief, forming part of the Gornovitza platform; thus the theory of a fracture opening a path for the river is untenable, since the gorge is Quaternary, and all dislocations had been effaced by Tertiary erosion. The problem cannot be studied apart from the history of the Alföld lake; the erosion of deposits of conglomerates at the mouth of the gorge, and traces of violent erosion below Turnu Severin, would correspond to a sudden emptying of this lake; while the deep cauldron of Kazan suggests a recent waterfall bursting probably from a cavern in the tithonic limestone with all the force of a subterranean stream. The lack of accord between the tributaries entering the gorge and the main stream is important. The transverse courses of the Jiu and the Oltu (Alt) are both ascribed to capture. The Surduc gorge of the Jiu is obviously young; its terraces are all Pleistocene, and correspond to those of the Petrosheni basin. It is seen to be cut down into the floor of an old Pliocene valley, and at a higher level the Riu Săs platform is traceable. A deposit

of detritus, which includes fragments of crystalline schist, lies on the present Jiu-Strciu divide, hence an old and vigorous river must once have flowed over this sill. The general level of the Riu Ses platform shows that the Mio-pliocene drainage was towards the north. A post-Pliocene uplift of the Petrosheni basin, coupled with the exceptionally low level of the Targu Jiu depression, determined the reversal of the direction of drainage. The Hatzeg basin is shown to have been at a higher level during the Pliocene than the Targu Jiu depression; its Tertiary beds were probably not powerfully eroded until the disappearance of the Alföld lake during the Quaternary. With regard to the Oltu, a study of the relief above the gorge, and of the striking discord between the rivers Bâias and Gressailor and the structural lines, shows that the region of the Roteturm gorge drained north before the Pliocene. The southward drainage dates from the end of this epoch; it was prepared for by the levelling of the Brezoiu-Titesol region, together with the lowering of the divide, which was facilitated by the extent of the flysch. The decisive events were the gradual sinking of lower Muntenia, which has continued right through the Quaternary, coupled with an uplift of Transylvania, including the Haromszeg and Fogarash basins, in harmony with the general south Carpathian post-Pliocene uplift. The evidence for the glaciation of the Southern Carpathians is complete, none of the characteristic glacial forms being absent, but cirques are the most characteristic feature. These are most numerous in the Banat massif and in the mountains of Fogarash, where the Boreaco platform had its greatest development; the glaciers rarely extended into the valleys. Their predominant easterly orientation is due to the fact that the most abundant precipitation accompanied the easterly winds. The lower limit of perpetual snow is placed at 1900 metres, and during a possible second glaciation at 2100 metres. The result of the glaciation has been to give an alpine character to some of the summits, especially those of Fogarash.

#### ASIA.

**Dr. Sven Hedin's Return.**—Dr. Sven Hedin has returned to India from his latest Tibetan Expedition, the latter stages of which have been as fruitful as the earlier in geographical results. It will be remembered that after reaching Gartok in the autumn of 1907 (*Journal*, vol. 31, pp. 216, 333), the traveller announced his intention of starting for Ladakh and Khotan. From a narrative of his subsequent journey communicated by Dr. Hedin to the *Times* of September 17 and 18, it appears that the mention of Khotan was intended to throw the Tibetans off the scent, for after organizing a fresh caravan at Leh, and making a northward start, he turned sharp to the east when two marches short of the Karakoram pass, in order to continue his work in South-Western Tibet. The narrative alluded to is too vague to permit the route to be followed throughout, but it is stated that the Aksai-chin was reached in January, 1908, the caravan suffering severely from constant snowstorms. On January 15 a temperature of  $-39^{\circ}8$  C. ( $-39^{\circ}6$  Fahr.) was registered. Dr. Hedin's feet were partly frozen, and all the sheep taken for food died. Eventually the party reached the Shemen-tso—which is shown as in  $34^{\circ}$  N.,  $81\frac{1}{2}^{\circ}$  E., in the maps of Captains Deasy and Rawling (*Journal*, November, 1900, and April, 1905)—and, continuing the march to the south-east, passed the Lemchang lake (Lenchung-cho of Deasy). Goldfields were seen on this section of the route, but they were deserted for the winter. Dr. Hedin now disguised his nationality and concealed his instruments in bags of rice, travelling as a common Ladakhi and posing as the servant of his caravan-bashi, Abdul Karim. Frequent suspicion was, however, aroused, while the difficulties of the march were increased by constant south-west storms. At Tong-tso, just

north of 32°, the routes of Nain Singh, Littledale, and Dr. Hedin's own route of 1901 were crossed, and the unknown tract between 32° and 30° was soon entered. The party marched due south, crossing several ranges running east and west, and obtaining food from the nomads. Beyond the Ladang pass, the hitherto unvisited province of Bongba was entered. After obtaining news of the great salt lake of Tabia Tsaka (the salt from which is a source of considerable wealth to the Government) and crossing two more ranges, Dr. Hedin once more reached the great range which bounds the Brahmaputra valley to the north. Its continuity—to test which was one of the main objects of the trip—was established, and the range was crossed for the eighth time by the Samyela pass, 18,000 feet high. The traveller now explored the course of the Charta-tsangpo, which is fed from huge snowpeaks and traverses a lake. At last, apparently in the neighbourhood of the Brahmaputra valley, his disguise was penetrated; but by showing a firm front, he effected a compromise with the authorities, the caravan being split up into two parts, with one of which, accompanied by an armed escort, he returned to the Bongba province. Crossing a pass of 19,000 feet in the great range, he reached the Tedenam-tso, heard of by Nain Singh in 1873, but of which the real name is Terenam. It proved to be long, narrow, and salt.\* Turning westward, he visited the Mending temple on the Soma Tsangpo, the largest Tibetan river without access to the ocean. Khala (shown on the Society's map as a peak) is really a pass in a high range branching off from the main system. Ghalarang-tso, described on the same map as containing a monastery on an island, was next visited. Its name should be Ngnanglaring-tso, and there are five islands. Finally, after crossing the great northern range for the tenth time, the traveller reached Manasarowar on July 26, and made his way by known routes to Simla. By his latest journeys Dr. Hedin has added to his previous achievements the exploration of the most important hitherto unknown part of Tibet; and his detailed examination of the great northern range, which, from the time of Brian Hodgson onwards, has been shown more or less hypothetically in our maps, is a service to geography which may well rank with any of the traveller's previous discoveries.

**Coast Features of Ceylon.**—We have received from Commander B. T. Somerville, R.N., the reprint of a paper by him published in *Spolia Zeylanica*, vol. 5, part 18, in which he deals with the submerged plateau surrounding Ceylon and certain characteristics of its coastline. The author, it will be remembered, commanded the *Sealark* during the recent research expedition in the Indian ocean, and his remarks are in part based on observations during soundings then carried out. The plateau referred to extends to an average distance of 12 miles from the land, when it falls with a well-marked drop to ocean depths. It shoals progressively from south to north, and is also marked by a slight deepening along its central line. As a general result of the ocean circulation in this part of the world, a current circulates round the island in the direction of the hands of a watch during the north-east monsoon, and in the contrary direction during the south-west monsoon, being variable at the change from one to the other. The author suggests that both current and swell are influenced by the existence of the submerged plateau, but does not allude to any influence which currents may have had on the origin of the plateau, though he remarks that the absence of the finer "green mud" from its surface may be due to its removal to greater depths by bottom currents. As regards the present coast-line, he calls attention to the strange absence of coral reefs all round the southern part of the island, and suggests that the outward extension of the coast progresses at such a rate as to prevent the

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\* On the Society's map of Tibet it is marked hypothetically just west of 86° E.

growth of coral. Another feature is the occurrence of lakes or lagoons all round the island, though their frequency and character vary from east to west and from north to south. They are held to point also to a rapid extension seawards of the lower portion of the island, which would itself seem to be composed of the detritus from the ancient mountainous core, under the action of the violent monsoon rains. The differences in the number and form of the lagoons is attributed to the differences in the character of the two monsoons, to the varying breadth of the lowlands, and to the effect of currents. Commander Somerville's general conclusion is that the low country of Ceylon has been derived from the denudation of the mountain country, and has been laid down on a plateau of which the existing 12-mile fringe is but a remnant. May not the plateau itself, however, be, in part at least, a product of recent denudation, as it would seem to be merely the submarine continuation of the lowlands?

**The New Flora of Krakatau.**—The great volcano of Krakatau, which by its famous eruption of 1883 destroyed every vestige of plant-life upon it, has afforded an unusually instructive object-lesson on the colonization of new land by vegetation, which can only be studied by actual observation on any large scale in the case of such exceptional occurrences. Visits by Dr. Treub, of the Buitenzorg botanic garden in Java, in 1886 and 1897, permitted the early stages of the re-peopling of the island by plants to be studied, and showed what an unusually important part was being played by the wind, as compared with other agencies, in affecting the transport of seeds, spores, etc., to the unoccupied surface. Thus, while in other cases that have been studied (those of coral and other low-lying islands) it has been the shore vegetation which has been most rapidly developed, in the case of Krakatau the inland species (particularly ferns) made good their footing equally quickly and in even greater numbers. A further study of the process has lately been made by Prof. A. Ernst of Zürich, who, thanks to the help of Dr. Treub, was able, with two companions, to pay a visit to Krakatau and neighbouring parts of the Straits of Sunda in April, 1906. A description of the visit, with a full discussion of the phenomena observed, appears in the *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich*, Jahrgang 52, Parts 3-4 (Zürich: Fäsi u. Beer, 1908). We can here refer only to the observations regarding Krakatau itself, though the flora of other islands in the Straits and of points on the coasts of Java and Sumatra was also examined. The writer and his companions were struck, on approaching the island, with the astonishing progress made by the vegetation, almost the whole south-eastern side, from the shore to the summit, being clothed in green. The present flora embraces all sections of the vegetable kingdom, and the total number of species collected during the three visits of 1886, 1897, and 1906 amounts to 137. An interesting section of the paper discusses the life-conditions afforded by Krakatau since the eruption, showing that the chemical composition of the soil and its physical properties were not so unfavourable as might be supposed. Apart from nitrates and phosphates, all the substances necessary to plant-growth were present in the volcanic deposits, while the missing constituents would be supplied through the agency of the wind, waves, rain, etc. Both algæ and bacteria would play an important part in preparing the soil for plant-life. Prof. Ernst enters fully into the question of the various modes of transport of plants and their seeds to the island (by the wind, currents, birds, etc.). The important part played by the wind may be explained by the comparative nearness of Krakatau to other lands, which permits the transport by wind of the seeds of such orders as *Gramineæ*, *Cyperaceæ*, and *Orchidææ*, as well as the spores of ferns. It is not easy to decide on the proportion of the flora brought by each agency, but Prof. Ernst concludes that from 39 to 72 per cent. have been brought by currents, 10 to 19 per cent. by birds,

and from 16 to 30 per cent. by the wind. Apart from the number of species, it is surprising how far the differentiation into plant-associations has already progressed.

**The Bashi or Batanes Islands.**—This small group of islands, first described by William Dampier, lies to the north of the Philippine group, of the territory of which it forms the most northern portion. It is officially designated Batanes, though Dampier's name Bashi (Bashee) is still sometimes used. In the *Philippine Journal of Science*, vol. 3, No. 1 (February, 1908), Mr. H. G. Ferguson gives the preliminary results of a three weeks' geological reconnaissance of the group lately carried out by him. According to the structure of the islands, the group may be divided into three sections, viz. (1) The islands consisting mainly of the older rocks, volcanic agglomerate with basic dykes. To this section belong Sabtan and the southern part of Batan, these being the southernmost of the larger islands. (2) The younger volcanic group, consisting of Mount Iraya in Batan, the island of Inem, and the Siayanca, a small group north of Isabayat. (3) The coral limestone group, Desquey, Ibujos, and most probably Isabayat, the largest of the Batanes. Sabtan is traversed diagonally by a belt of rolling upland terminating eastward in an irregular escarpment of agglomerate, and falling seawards on the west in a still higher line of cliffs. The southern portion is extremely rugged. Batan, in its larger, southern part, is traversed by a range of hills and various irregular spurs, while the northern end is dominated by the volcano Iraya, a beautifully symmetrical cone 3800 feet high. Remains of an older and larger cone still surround it. Marine erosion has cut away the lower slopes, leaving cliffs from 50 to 200 feet in height. The Piedmont region is composed of stratified sandstone and conglomerate, poorly consolidated. In this flat region lies Santo Domingo de Basco, the largest town in the islands, possessing the only harbour with a beach unobstructed, by coral. Of the other islands, Ibujos consists entirely of coral limestone rising in steep cliffs to a height of 200 feet, while Isabayat is likewise surrounded by cliffs, the only landing being by means of steps cut in the rock or ladders. The natives of Batan and Sabtan were formerly divided into three hostile clans, and their village forts were built on commanding eminences; but in more recent times these have been abandoned, villages being placed either where gaps in the reefs occurred, or in the neighbourhood of arable land. The natives of Isabayat are more completely isolated, and have retained their own language and a peculiar art of basket making. The islands owe their origin to volcanic outbursts, and vulcanism has been a factor in all stages of their history, interfering with the normal geographical cycle. In recent times there has been a lessening of area. The physical features are illustrated by photographs.

#### AFRICA.

**Grass-burning in Tropical Africa.**—As is well known, it is a general custom among the natives of the more open parts of tropical Africa to burn down the grass annually, in order, among other objects, that the old and withered grass may be cleared away and give room for the growth of the fresh and tender herbage. The precise effect of this practice on the vegetation generally has not yet been studied so systematically as could be wished, and very divergent views have been expressed by travellers as to the preponderance of benefit or the reverse when a balance is struck. A beginning in the desired direction has lately been made by Dr. Walther Busse, a member of the Imperial Biological Institute for Agriculture and Forestry, who has made a careful study of the subject during his residence in the German African territories, and has likewise collected a considerable body of other observations from the published accounts of travellers. The results are put

forward in a paper printed in the *Mitteilungen aus den Deutschen Schutzgebieten*, 1908, No. 2. Dr. Busse has drawn chiefly, it is true, upon the observations of German travellers, and hardly extends his survey beyond the borders of German African territories, but the extent of country covered by these in various parts of the continent justifies us in regarding them as more or less typical of the whole. As an introduction to the subject, Dr. Busse enters at some length into the mode of origin of the African steppes (under which term he includes all the unforested regions, including those sometimes distinguished as savannahs), and he shows reason for thinking that the greater part of these was once forest-clad, the former forests having been destroyed by human agency. Togo, though naturally a part of the West African forest belt, is now essentially a region of steppes, and this fact is ascribed to the considerable southward movement of peoples of which the region has been the scene. When once the forest has been cleared for purposes of agriculture, it has little chance of establishing itself afresh in its original form, though an intermediate type of bush vegetation often holds the ground for a time before the true grass steppe, characterized above all by species of *Andropogon*, is found. As regards the effect of the annual grass-burnings, this varies immensely in different localities, both according to the height and density of the grass, and to the conditions of moisture in the soil, the greatest damage to trees being of course done where the sub-soil is dry. Again, some trees are far better able than others to adapt themselves to the altered conditions, and these are the species which still hold their own, either singly or as scattered forest, in the midst of the steppe-lands. They are considered by Dr. Busse as representing, in general, the remnants of a former moist forest, not as species which have since established themselves in the steppe-lands. While recognizing to the full the impossibility of re-establishing the old moist forest in the steppes, Dr. Busse insists on the importance of systematic forestry in the African possessions, and shows how much the task is made difficult by the grass-burnings, which therefore need to be placed under restrictions. The fertilizing value of the ash is inconsiderable, except for the grass itself, as it lacks many of the constituents needed by other crops. For pastoral operations, however, the burning is a necessity, as otherwise the new growth has little chance of making headway. It is thus important to pay regard to local circumstances in any discussion of the question.

#### AUSTRALASIA AND PACIFIC ISLANDS.

**Early French Voyages to the Pacific.**—Comparatively little has been known, at least by the general reader, respecting the early French commercial ventures in the Pacific, anterior to the voyage of Bougainville. A useful contribution to this subject has been made by Mr. Dahlgren, Director of the Royal Library at Stockholm, who has for some time been known as a student of Pacific voyages.\* In vol. 14 of the *Nouvelles Archives des Missions Scientifiques* he has given a concise outline of the history of French enterprise in the Pacific between 1695 and 1749, with a systematic list of all the ships sent out from France during that interval, a summary statement of the course and results of the voyages, and a reference to the authority in each case. The work is to a large extent based on original research in the official French archives and elsewhere. French commercial enterprise in this direction may be said to have dated from the foundation of the "Compagnie de la

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\* In 1900 he published, as vol. 13 of *Ymer*, an account of various French voyages in the early part of the eighteenth century, though, through being written in Swedish, it has not been widely available.

mer du Sud" in 1698, and the period of greatest activity was from 1705 to 1724, for though on the conclusion of a treaty with Philip V., the French king was complaisant enough to forbid the enterprise of the company, the trade proved so lucrative that it was maintained for a time in contraband form. But the more stringent prohibitions issued by Louis XIV. in 1716, and renewed in 1724, finally put a stop to it, and the French ships employed in the later voyages were mostly freighted by Spanish merchants. Contemporary statements as to the specie brought into France during the early part of the century place the amount at a very high figure, but Mr. Dahlgren thinks that these must be received with caution. The number of ships despatched between 1695 and 1726 works out as 168, of which 117 returned, while the remainder were either sold, lost, or seized by the Spanish authorities.

#### MATHEMATICAL AND PHYSICAL GEOGRAPHY.

**Mountain Morphology.**—In part i. of the ninth volume of Penck's *Geographische Abhandlungen*, Dr. Gustav Göttinger discusses the origin of round-backed ridges in mountain districts. The slopes of two adjacent valleys may meet in a sharp ridge, or a more or less level strip of land may intervene—an "even-topped upland" in Prof. Davis's nomenclature—or, thirdly, a round back, Prof. Davis's "subdued hill," may fall gradually to the valley slopes. The development of the last form from the other two has been studied by the author for four years in various regions, but chiefly in the Wiener Wald during excursions with Prof. Penck. In the Wiener Wald, where the sculpturing of the valleys is almost everywhere complete, the principal agent in the formation of rounded backs is the gradual creeping down of the detritus, which has covered up the inequalities of the slopes, protecting the rocks, whether hard or soft, from erosion, and leaving the ridges or the edges of the flat uplands exposed to atmospheric action. Sharp rocks on the summit are eaten away, and a narrow rounded back is formed which is gradually broadened by the weathering of the top and the creeping down of the waste. The gentler the slope, the slower is the development of broad summits, and vegetation also retards the progress of denudation, though, particularly on gentler slopes, the roots promote the movement of the detritus, and here the formation of loam soaked with water, which runs off less freely, keeps up the creeping motion. Though creeping may be observed in many climates, even in rainless deserts where it is a consequence of extremes of temperature, it may not always be the predominating factor, for in deserts deflation plays an important part. Dr. Göttinger was, therefore, desirous of examining the formation of subdued mountains in another country, and for this purpose made an excursion to Istria, where the rain is torrential and there are long intervals of drought. He was also able to compare the flysch country of Istria with that of the Wiener Wald. In this formation he found that the wind had a certain effect, though the larger forms were here also due to creeping, but in the limestone region there are no rounded crests, for the *débris* is insufficiently protected by the scanty vegetation, and is washed away by the heavy rains. Lastly, Dr. Göttinger inquires whether there are traces in the flysch of the Wiener Wald of different climates in earlier ages with other forms of denudation. His answer is that the older forms of the rounded backs are entirely obliterated, and that even those of the Ice Age cannot be determined with certainty. These general results are based on a long series of observations, which are illustrated by sketches and photographs.

**GENERAL.**

**A Geographer's Life-work.**—On September 7 last, Mr. and Mrs. E. G. Ravenstein celebrated the fiftieth anniversary of their wedding, and in connection with this auspicious event Mr. Ravenstein has printed for private circulation a list of the most important maps, books, and papers drawn, compiled, or written by him from 1853 to the present time. Although not by any means exhaustive, the list forms a brochure of forty-seven pages, and bears witness to the untiring industry and close application exhibited by the veteran geographer during his long and busy career. The headings under which the publications are grouped show also the many-sided character of his geographical labours, which, apart from his valuable contributions to cartographical progress, have embraced such subjects as climatology, political geography and statistics, and varied studies in the history of geography and exploration. It is worth calling special attention to his work in connection with a British Association Committee for the consideration of methods of map-making as applied to the physical map of the British islands. Specimen maps prepared by him were tinted in nine different ways, in one of which the colours of the prism were employed with success in regular succession. It is not perhaps widely known that a subject in which he at one time took a keen interest was that of physical education, with especial reference to the adoption of a national system in elementary schools. An essay on this subject was awarded the first prize by the National Olympic Association, founded at Liverpool in 1865. He also prepared a 'Handbook of Gymnastics and Athletics,' which saw the light in 1867. We wish him health to enjoy a well-earned rest from his more arduous labours, while trusting that geography may still continue to reap the fruit of his wide knowledge and experience.

**Geographical Course at the London School of Economics.**—An instructive series of lectures and classes is, as usual, arranged at this school for the academic year now opening, and although primarily intended for those who approach the subject from the economic side, the study is throughout based on physical geography, and the course will therefore supply a good general insight into geographical methods and applications. In the Michaelmas Term an introductory course by Mr. Mackinder will deal with such methods as illustrated by a study of two special regions, and in connection with it a class will be held by Mr. Sargent, on the use of maps in Economic Geography and the general relations of geographical facts to industry and commerce. In the Lent and summer terms Mr. Mackinder will deliver a course on Regional Geography, the great divisions of the world being considered in order. In the same terms Mr. Sargent will deal with Economic Geography, applying in detail to special regions the general principles studied in the previous course. Other items in the programme are a course by Mr. Mackinder on "The Map of Europe studied Historically" (in which preference will be given to teachers, should it be necessary to limit the class), and one by Mr. Sargent in which Modern Historical Geography will be illustrated by a study of the geographical factor in the political and economic development of North America. Several of the courses will be repeated at 7 p.m. for the special benefit of evening students.

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## CORRESPONDENCE.

### Burma.

With the assistance of Mr. J. C. Clancey and Mr. Taw Sein Ko, the Burma Government archæologist, I have now been able to identify the "Snake Kyaung" in



TILIN-DAIK-THEIN

Mandalay, referred to in my review of Sir George Scott's book on Burma, published in the Society's *Journal* (vol. 30, pp. 431 *et seq.*) as the Tilin-daik-Thein. It appears that the *thein*, or "ordination hall," has been renovated by plain multiple roofing to replace the original carved roof, which was in a tottering condition when I last saw it in 1904. Of course, the character of the original structure has considerably altered in appearance, much to its detriment, but the present roofing, being of a more durable nature than a wooden one, will serve at any rate to preserve the carved supports and pillars, which, after all, are the most fascinating parts of the building. Mr. Clancey has been good enough to send me a photograph of the *thein* before renovation, which is now reproduced.

J. R. H.

August 8, 1908.

## GEOGRAPHICAL LITERATURE OF THE MONTH

### *Additions to the Library.*

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are as a rule written in full:—

A. = Academy, Academie, Akademie.  
 Abh. = Abhandlungen.  
 Ann. = Annals, Annales, Annalen.  
 B = Bulletin, Bollettino, Boletim.  
 Col. = Colonies.  
 Com. = Commerce.  
 O.R. = Comptes Rendes.  
 E. = Erdkunde.  
 G. = Geography, Géographie, Geografia.  
 Ges. = Gesellschaft.  
 I. = Institute, Institution.  
 Is. = Ivestiya.  
 J. = Journal.  
 Jb. = Jahrbuch.  
 k.k. = kaiserlich und königlich.  
 M. = Mitteilungen.

Mag. = Magazine.  
 Mem. (Mém.) = Memoirs, Mémoires.  
 Met. (mét.) = Meteorological.  
 P. = Proceedings.  
 R. = Royal.  
 Rev. (Riv.) = Review, Revue, Rivista.  
 S. = Society, Société, Selakab.  
 Sc. = Science(s).  
 Sitzb. = Sitzungsbericht.  
 T. = Transactions.  
 Ts. = Tijdschrift, Tidskrift.  
 V. = Verein.  
 Verh. = Verhandlungen.  
 W. = Wissenschaft, and compounds.  
 Z. = Zeitschrift.  
 Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 x 6½.

A selection of the works in this list will be noticed elsewhere in the "*Journal*."

### EUROPE.

Central Europe—Meteorology. *Petermanns M.* 54 (1908): 57-60. Knörzer.  
 Temperaturanomalien in Mitteleuropa, hervorgerufen durch südöstliche und südwestliche Maxima. Eine klimatologische Studie von A. Knörzer. *Maps*.

Europe—Ethnography. Deniker.  
 Association Française pour l'Avancement des Sciences: Congrès de Lyon, 35<sup>e</sup> Session, 1906. Les races de l'Europe. II. La taille en Europe. Par J. Deniker. Paris, 1908. Size 10 x 6½, pp. 144. *Map*.

France—Hérault. *B.S. Languedoc. G.* 31 (1908): 86-118. Gennevax and Manche.  
 Recherches spéléologiques dans la région du Pic Saint-Loup. Par Maurice Gennevax et Albert Manche. *Map, Sections, and Illustrations*.

France—Morbihan. *B.I. Océanogr. Monaco*, No. 116 (1908): pp. 30. Joublin.  
 Études sur les gisements de mollusques comestibles des côtes de France: le Morbihan oriental. Par L. Joublin. *Maps*.

- France—Belief.** *Ann. G.* 17 (1908): 205-223. **Briquet.**  
 La pénéeplaine du nord de la France. Par A. Briquet. *Maps and Sections.*
- Germany—Baden.** *G.M. Hessen* 4 (1908): 67-116. **Riedel.**  
 Die Einteilung des Odenwalds in orographische Gruppen. Ein Beispiel für die Ergebnisse orometrischer Untersuchungen zur Einteilung von Gebirgen. Von Wilhelm Riedel. *Map and Sections.*
- Germany—Cartography.** *Globus* 94 (1908): 1-6. **Wolkenhauer.**  
 Seb. Munsters verschollene Karte von Deutschland von 1525. Von Dr. August Wolkenhauer. *Facsimile-map.*  
 Two copies of this map have lately been brought to light (*ante*, p. 424).
- Germany—Danube.** *Deutsche G. Blätter* 31 (1908): 109-116. **Verbeek.**  
 Die Donauversickerung bei Immendingen. Von Dr. Paul Verbeek.  
 See note in vol. 31, p. 440.
- Germany—Hessen.** *G.M. Hessen* 4 (1908): 1-66. **Loos.**  
 Zur Hydrographie des Westerwaldes. Von Fritz Loos. *Map and Sections.*
- Germany—Rhine Basin.** *Petermanns M.* 54 (1908): 73-78. **Oestreich.**  
 Studien über die Oberflächengestalt des Rheinischen Schiefergebirges. Von Dr. Karl Oestreich. *Map.*  
 Discusses the physical geography of the middle Rhine valley and neighbouring highlands in Pliocene times.
- Holland—Rotterdam.** **Lintum.**  
*Ts. K. Nederland. Aardr. Genoots.* 25 (1908): 197-252, 443-469.  
 De oorzaken van Rotterdam's opkomst en ontwikkeling. Door Dr. C. te Lintum.
- Iceland.** *Globus* 93 (1908): 181-185. **Spethmann.**  
 Dr. v. Knebels Islandexpedition im Sommer 1907. Vorläufiger Reisebericht von Hans Spethmann. *Sketch-map and Illustrations.*  
 See note in the June number, p. 672.
- Italy—Apennines.** *Riv. G. Italiana* 15 (1908): 193-207. **Martelli.**  
 Di alcune recenti idee sulla struttura dell' Appennino, e specialmente di un preteso carreggiamento Dalmato-Garganico. Del dott. Alessandro Martelli.
- Italy—Geographical Terms.** **Lorenzi.**  
*Riv. G. Italiana* 15 (1908): 28-43, 78-90, 149-169.  
 Geonomastica Polésana. Termini geografici dialettali raccolti nel Polesine da Arrigo Lorenzi.
- Italy—Piedmont.** *Riv. G. Italiana* 15 (1908): 208-225. **Revelli.**  
 Il Lago di Co' di Lago (Devero; Ossola). Ricerche del prof. Paolo Revelli. *Sketch-map and Illustration.*
- Italy—Sicily—Etna.** *C.R.A. Sc. Paris* 146 (1908): 1071-1076. **Lacroix.**  
 Sur la récente éruption de l'Etna. (Taormina, 15 mai 1908.) Note de M. A. Lacroix.  
 Although considerably more than the average interval had elapsed since the last previous eruption (1892), that of May 15 last was but of slight importance.
- Spain—Sierra Nevada.** *Z. Ges. E. Berlin* (1908): 294-316, 407-426. **Quelle.**  
 Beiträge zur Kenntnis der spanischen Sierra Nevada. Von Dr. Otto Quelle. *Illustrations.*

## ASIA.

- Asia—Historical.** **Sumpa Khan-po.**  
 Pag Sam Jon Zang. Part I. History of the rise, progress, and downfall of Buddhism in India (pp. viii., iv., 146, and cxlviii.). Part II. History of Tibet from early times to 1745 A.D. (pp. x., xxvi., and 147-430). By Sumpa Khan-po Yege Pal Jor . . . edited by Sarat Chandra Das. Calcutta, 1908. Size 9½ x 6. [In Tibetan. Introductions, contents, and analytical index to Part I. (pp. i-cxlviii.) in English.]
- Ceylon—Historical.** *J. Ceylon Branch R. Asiatic S.* 19 (1908): 284-400. **Ferguson.**  
 Discovery of Ceylon by the Portuguese in 1506. By Donald Ferguson. *Portraits and Illustration.*

**Ceylon—Morphology.****Somerville.**

The submerged plateau surrounding Ceylon: some considerations regarding the formation of the coast-line. By B. T. Somerville. (Reprinted from 'Spolia Zeylanica,' vol. 5, part xviii., April, 1908.) Size  $9\frac{1}{2} \times 6$ , pp. 69-78. *Maps and Sections.*

See note, *ante*, p. 427.

**China—Hong Kong.**

List of villages in New Kowloon in the Southern District [of the new territory of Hong Kong] (pp. 3). List of villages in the Northern District of the New Territory (pp. 10). Chinese names of islands, bays, hills, and passes in the War Office map of Hong Kong and the Leased Territory (pp. 5). [Hong Kong, 1907.] Size  $13 \times 8\frac{1}{2}$ .

**China—Szechuan.** *Ts. K. Nederland. Aardr. Genoots.* 25 (1908): 470-512. **Abendanon.**  
Overzicht der geographie en geologie van het "Roode Bekken," in de provincie Se-tsoean (Midden-China). Door E. C. Abendanon. *Maps and Illustrations.***China—Szechuan.****Guebriant.**

*Missions Catholiques* 40 (1908): 164-166, 172-173, 199-203, 207-209, 221-224.

Chez les Lolos. Par le R. P. de Guebriant. *Illustrations.*

Father Guebriant has been known for some time as one of the most active of the French missionaries in Western China.

**China—Yunnan.***La G., B.S.G.* 17 (1908): 247-252.**D'Ollone.**

*La Mission d'Ollone. Map.*

See note in the August number, p. 183.

**Chinese Empire.***Z. Ges. E. Berlin* 1908: 377-395.**Tafel.**

Vorläufiger Bericht über seine Studienreise in Nord-West China und Ost-Tibet.

Von Dr. Albert Tafel. *Illustrations.*

Dr. Tafel's journey has been frequently referred to in the *Journal*.

**India—Himalaya.***Alpine J.* 24 (1908): 107-133.**Longstaff.**

Mountaineering in Garhwal. By T. G. Longstaff. *Map and Illustrations.*

**India—Himalaya.***Alpine J.* 24 (1908): 139-148.**Workman.**

Nieves Penitentes in Himalaya. By William Hunter Workman. *Illustrations.*

**AFRICA.****Abyssinia—Historical.****Beccari.**

Rerum Æthiopicarum Scriptores Occidentales inediti a Sæculo XVI. ad XIX., curante C. Beccari. Vol. 6. P. Emmanuelis d'Almeida, s.j., Historia Æthiopis; Liber v.-viii. Rome: C. de Luigi, 1907. Size  $10\frac{1}{2} \times 7\frac{1}{2}$ , pp. xii. and 534. Price 20s. 8d.

**Abyssinia—Kaffa.***Globus* 93 (1907): 165-169, 186-189.**Bieber.**

Das staatliche Leben des Kaffitscho. Von Friedrich J. Bieber. *Illustrations.*

**Africa—Phytogeography.** *M. deuts. Schutzgebieten* 21 (1908): 113-139.**Busse.**

Die periodischen Grasbrände im tropischen Afrika, ihr Einfluss auf die Vegetation und ihre Bedeutung für die Landeskultur. Von Dr. Walter Busse. *Illustrations.*

See note, *ante*, p. 429.

**Cape Colony.****Manning.**

Trout-fishing in the Cape Colony. By Dumaresq W. Manning. Cape Town: Argus Publishing Co., 1908. Size  $9\frac{1}{2} \times 6$ , pp. 98 and xxxiv. *Map and Illustrations. Presented by the Publishers.*

**Central Africa.***Deutsches Kolonialblatt* 19 (1908): 671-677.**Mecklenburg.**

Die zentralafrikanische Expedition S.H. des Herzogs Adolf Friedrich zu Mecklenburg-Schwerin.

**Central Africa—Communications.** *Mouvement G.* 25 (1908): 301-306.**Wauters.**

Les voies d'accès au Katanga. Par A. J. Wauters. *Maps.*

**Dahome.****Hubert.**

Henry Hubert. Mission scientifique au Dahomey. Paris: E. Larose, 1908. Size  $10 \times 6\frac{1}{2}$ , pp. 568. *Maps and Illustrations. Price 15 fr. Presented by the Author.*  
An expert description of the physical conditions of the country.

- Egypt—Nile.** *P.S. Biblical Archaeology* 30 (1908): 206-207. **Platt.**  
The origin of the name of the island of Elephantine. By A. F. R. Platt.  
*Illustration.*  
Suggests that the name originated in the shape of some of the rocks.
- Egypt—Nubia.** *Cairo Soc. J.* 2 (1908): 185-190. **Scott.**  
Note on the present Nubian survey. By T. D. Scott.
- Egypt and Sudan.**  
Egypt No. 1 (1908): Reports by His Majesty's Agent and Consul-General on the finances, administration, and condition of Egypt and the Sudan in 1907. London: Wyman & Sons, 1908. Size 13 × 8½, pp. 68. *Price* 7½d.
- French Congo.** *La G., B.S.G.* 17 (1908): 256-261. **Bel.**  
Étude géologique et minière du bassin du Niari. Par J.-M. Bel. *Sketch-map.*
- French Congo—Railway.** *La G., B.S.G. Paris* 17 (1908): 261-264. **Mornet.**  
Reconnaissance d'un tracé de voie ferrée de Brazzaville à l'Océan. Par le Capitaine Mornet. *Sketch-map.*

## NORTH AMERICA.

- Alaska.** *Smithsonian Misc. Coll.* 51 (1908), No. 1807: pp. 38. **Gilmore.**  
Smithsonian exploration in Alaska in 1907 in search of Pleistocene fossil vertebrates. By Charles W. Gilmore. *Maps.*
- Alaska.** *U.S. Geol. Surv. Water-supply Paper* 218 (1908): pp. 156. **Henshaw and Covert.**  
Water-supply investigations in Alaska. 1906-1907. By Fred. F. Henshaw and C. C. Covert. *Maps and Illustrations.*
- America—Fauna.** **Lobley.**  
The American Fauna and its origin. By Prof. J. Lobley. (From the *Transactions of the Victoria Institute*, April 6th, 1908.) Size 8½ × 5½, pp. 32. *Presented by the Author.*
- Canada—British Columbia.** **Ells.**  
*Annual Rep. Geol. Surv. Canada* 16 (1904), *Rep. B.*: pp. 46.  
Report on Graham Island, B.C. By R. W. Ells. *Maps.*
- Canada—British Columbia.** **Leach.**  
The Telkwa river and vicinity, B.C. By W. W. Leach. Ottawa, 1907. Size 9½ × 6, pp. 24. *Map.*
- Canada—North-West.** *J.R. Statistical S.* 71 (1908): 397-404. **Godfrey.**  
Settlement and agriculture development of the North-West Provinces of Canada. By Ernest H. Godfrey.
- Canada—Ontario.** **Collins.**  
Department of Mines. Report on a portion of North-Western Ontario traversed by the National Transcontinental Railway between Lake Nipigon and Sturgeon Lake. By W. H. Collins. Ottawa: S. E. Dawson, 1908. Size 10 × 6½, pp. 24. *Map and Illustrations.*  
The map embodies all the geological data available.
- Canada—Yukon.** **Camsell.**  
*Annual Rep. Geol. Surv. Canada* 16 (1904): *Rep. OC.*: pp. 50.  
Report on the Peel river and tributaries, Yukon and Mackenzie. By C. Camsell. *Map and Illustrations.*  
Describes explorations carried out in 1905, and already referred to in the 'Summary Report' for that year (*Journal*, vol. 29, p. 348).
- Canada—Yukon.** *Annual Rep. Geol. Surv. Canada* 16 (1906), *Rep. O.*: pp. 24. **Keele.**  
Report on the upper Stewart river region, Yukon. By J. Keele. *Map and Illustrations.*
- North America—Zoology.** *National G. Mag.* 19 (1908): 387-446. **Shiras.**  
One season's game-bag with the camera. By George Shiras. *Illustrations.*  
Describes photographic trips in the West Indies, Florida, New Brunswick, Newfoundland, etc.
- United States—Anthropogeography.** *J.G.* 6 (1908): 209-214. **Libby.**  
Physiography as a factor in community life. By Prof. O. G. Libby.  
Illustrates the influence of geography on history by the fortunes of various states of the Union.

## CENTRAL AND SOUTH AMERICA.

## Argentina—Ethnology.

Ambrosetti.

Exploraciones arqueológicas en la ciudad prehistórica de "La Paya" (Valle Calchaquí—Provincia de Salta). Campañas de 1906 y 1907. Par Juan B. Ambrosetti. (Facultad de Filosofía y Letras: Publ. de la Sección Antropológica, No. 3 (1ª parte).) Buenos Ayres, 1907. Size 11 × 7½, pp. 278. *Maps, Plans, and Illustrations.*

## Bolivia.

Wright.

Bolivia: the central highway of South America—a land of rich resources and varied interest. By Marie Robinson Wright. Philadelphia and London, [1907]. Size 12½ × 10, pp. 450. *Map and Illustrations. Presented by Colonel Pedro Suarez.*

A profusely illustrated general account of the country, laying stress on its economic advantages and prospects.

## Brasil.

Wettstein.

Brasilien und die deutsch-brasilianische Kolonie Blumenau. Von D. Wettstein. Leipzig: F. Engelmann, 1907. Size 10 × 7½, pp. xiv. and 346. *Maps and Illustrations. Price 18m. 50.*

A general description of the geographical and historical relations of Brasil as a whole serves as an introduction to a particular account of the Blumenau colony in the state of Santa Catharina, primarily from an economic point of view.

## Brasil—Phytogeography.

Ule.

*Vegetationsbilder (Karsten and Schenck)* 7 (1908): Pls. 13–18.

Das Innere von Nordost-Brasilien. Von Ernst Ule. *Plates.*

## Central and South America.

Ranca.

*B.S.G. Italiana* 8 (1907): 405–430, 514–542, 679–694, 763–784, 879–902, 1006–1022, 1122–1147, 1238–1258; 9 (1908): 49–66, 157–167, 263–271.

Dalle Antille alle Guiane e all' Amazonia. Note intorno al viaggio della R. Nave "Dogali" dal febbraio 1904 al luglio 1905, del cap. Gregorio Ranca. *Maps.*

## Columbia.

*Globus* 93 (1908): 302–305.

Koch-Grünberg.

Einige Bemerkungen zu der Forschungsreise des Dr. H. Rice in den Gebieten zwischen Guaviare und Caquetá-Yapurá. Von D. Theodor Koch-Grünberg. *Maps.*

Discusses the information contained in Dr. Rice's letter (*Journal*, vol. 31, p. 308), showing that some of the streams crossed must be the headwaters of the Isanna. The tribe mentioned by Dr. Rice seems to be that of the Enaguas, who have nothing to do with the Omaguas.

## Peru.

Enock.

Peru: its former and present civilisation, history, and existing conditions, topography and natural resources, commerce, and general development. By C. Reginald Enock. London: T. Fisher Unwin, 1908. Size 9 × 6, pp. xxxii. and 320. *Map and Illustrations. Price 10s. 6d. net. Presented by the Author.*

## Venezuela.

*Petermanns M.* 54 (1908): 69–70.

Sievers.

Eine neue Karte von Venezuela. Von W. Sievers. *Map.*

The map presents the results of the new official survey.

## Venezuela—Phytogeography.

Jahn.

Las palmas de la flora venezolana. Monografía botánica, por Alfredo Jahn. Caracas, 1908. Size 9 × 6, pp. 126. *Presented by the Author.*

## West Indies—Martinique.

Heilprin.

The eruption of Pelée: a summary and discussion of the phenomena and their sequels. By Angelo Heilprin. Philadelphia: J. B. Lippincott Co., for the Geographical Society, 1908. Size 14 × 11, pp. viii. and 72. *Portrait and Illustrations. Presented by the Publishers.*

## AUSTRALASIA AND PACIFIC ISLANDS.

## Australia—Hydrology.

Pittman.

Geological Survey of New South Wales. Problems of the artesian water-supply of Australia, with special reference to Prof. Gregory's theory. By E. F. Pittman. Sydney, 1908. Size 9½ × 6, pp. 80. *Map, Illustration, and Sections.*

Contests the correctness of Prof. Gregory's views.

- Australia—Irrigation.** *J.R. Colonial I.* 39 (1908): 421-450. **Coghlan.**  
The possibilities and prospects of irrigation in Australia. By T. A. Coghlan.
- New Guinea—Dutch.** **Hellwig.**  
*Ts. K. Nederland. Aardr. Genoots.* 25 (1908): 584-619.  
De Arbeid van het exploratie-detachement in Zuid-Nieuw-Guinea. Naar "Pioneer" en R. L. A. Hellwig. *Map.*
- New Guinea—Dutch.** **Wichmann.**  
*Ts. K. Nederland. Aardr. Genoots.* 25 (1908): 571-580.  
De "Moordenaars-rivier" en de "Doodslagers-rivier" op Nieuw-Guinea. Door A. Wichmann. *Map.*
- New Zealand—Southern Islands.** *Kew B.* (1908): 237-249. **Cockayne and Smith.**  
The Southern Islands expedition. [Extracts from accounts by Dr. L. Cockayne and Captain Dorrien Smith.] *Illustrations.*  
Noticed in the September number, p. 310.
- Pacific Islands and Malaysia.** **Guillemard and Keane.**  
Stanford's Compendium of Geography and Travel (New Issue). Australasia. Vol. 2, Malaysia and the Pacific Archipelagoes. By F. H. H. Guillemard. Second edition, revised by Dr. A. H. Keane. London: E. Stanford, 1908. Size 8 x 5, pp. xvi. and 574. *Maps and Illustrations.* Price 15s. Presented by the Publisher.
- Torres Straits—Ethnology.**  
Reports of the Cambridge Anthropological Expedition to Torres Straits. Vol. 6. Sociology, magic, and religion of the Eastern Islanders. Cambridge: University Press, 1908. Size 11½ x 8½, pp. xx. and 316. *Maps and Illustrations.* Price 21s. net. Presented by the Publishers.

## POLAR REGIONS.

- Antarctic—Belgian Expedition.**  
Expédition Antarctique Belge. Résultats du voyage du S.Y. *Belgica* en 1897-1898-1899; sous le commandement de A. de Gerlache de Gomery. Rapports scientifiques. Zoologie: Ostracoden, von G. W. Müller (pp. 8); Holothuries, par E. Hérouard (pp. 16); Insectes (pp. 92); Medusen, von Otto Maas (pp. 32); Cirripedia, by P. P. C. Hoek (pp. 10); Pennatuliden, von Hector F. E. Jungersen (pp. 12); Scaphopoden, von L. Plate (pp. 4); Turbellarien, von Ludwig Böhmig (pp. 32). Océanographie: Relations thermiques; rapport sur les observations thermométriques faites aux stations de sondages, par Henryk Arctowski et Hugh Robert Mill (pp. 36). Géologie: Les glaciers; glaciers actuels et vestiges de leur ancienne extension. Par Henryk Arctowski (pp. 74). Physique du Globe: Mesures Pendulaires, par G. Lecointe (p. 40). Antwerp, 1906-1908. Size 13½ x 11. *Maps, Diagrams, and Illustrations.* Presented by the Commission de la *Belgica*.
- Antarctic—British Expedition.** **Mulock.**  
National Antarctic Expedition, 1901-1904. Charts. By Lieut. G. F. A. Mulock. London: R.G.S., 1908. Size 10 x 6½, (Charts) 6 sheets; (Text) 8 pp. Price (to Fellows) 9s. net; (to non-Fellows) 12s. 6d. net.
- Antarctic—German Expedition.** **Drygalski.**  
Deutsche Südpolar-Expedition, 1901-1903. Im Auftrage des Reichsamtes des Innern herausgegeben von Erich von Drygalski. II. Band. Kartographie, Geologie, Heft 2, VI. Band. Erdmagnetismus, Heft 2. Berlin: G. Reimer, 1908. Size 14 x 10½. *Maps, Illustrations, and Diagrams.* Presented by the Imperial Foreign Office, Berlin.
- Antarctic—Paleobotany.** *Globus* 93 (1908): 366-368. **Neger.**  
Die untergegangene Pflanzenwelt der Antarktis. Von F. W. Neger.
- Arctic—North-West Passage.** **Amundsen.**  
Roald Amundsen's 'The North-West Passage;' being the record of a voyage of exploration of the ship *Gyda*, 1903-1907, by Roald Amundsen; with a supplement by First Lieutenant Hansen. 2 vols. London: A. Constable & Co., 1908. Size

9½ × 6½, pp. (vol. 1) xiv. and 336; (vol. 2) x. and 398. *Maps and Illustrations.* Price 31s. 6d. *net.* Presented by the Publishers.

See review in the August number, p. 171.

**Arctic—Travel.** *B. American G.S.* 40 (1906): 210–213. **Stefansson.**  
Suitability of Eskimo methods of winter travelling in scientific exploration. By V. Stefansson.

**Arctic Ocean.** **Denucé.**  
La seconde Expédition Polaire Allemande, 1869–1870. Une liste inédite de sondages d'eau de mer profonde du Capitaine Hegemann. Par J. Denucé. Brussels, 1907. Size 9 × 6, pp. 10.  
The list has been supplied by Captain Hegemann, who commanded the *Hansa* in 1869.

### MATHEMATICAL GEOGRAPHY.

**Cartography—Terminology.** **Pollacchi.**  
Lecture des cartes anglaises et des États-Unis. Indications linguistiques, géographiques et topographiques. Par Captain P. Pollacchi. Paris: R. Chapelot et Cie., 1908. Size 10 × 8, pp. 158. *Diagrams.* Presented by the Author.

Mr. Knox's 'Glossary of Topographical Terms,' issued as a volume of 'Stanford's Compendium,' seems to have been largely drawn upon in the compilation of this work.

**Geodesy.** **Krüger.**  
Veröffentlichung des Königl. Preussischen Geodätischen Institutes, Neue Folge, No. 34. Bedingungs-gleichungen für Liniennetze und für Rückwärtseinschnitte. Von L. Krüger. Potsdam, 1908. Size 11 × 9, pp. 50. *Diagrams.*

**Height-determination.** *Met. Z.* 25 (1908): 193–200. **Mohn.**  
Neue Studien über das Hypsometer. Von H. Mohn.

**Position determination.** **Rambaldo.**  
Astronomische Ortsbestimmung im Ballon. Von Oberleutnant A. E. Rambaldo. (Sonderabdruck aus 'Illustrierte aeronautische Mitteilungen,' Heft 10, 1908.) Berlin, 1908. Size 10 × 6½, pp. [8].

**Surveying.** **Clancey.**  
Aid to land-surveying, embracing chain, compass, plane-table, and theodolite surveying, levelling, practical astronomy, etc. 3rd (Large) edit. (pp. xvi., 274, and xvi.). Calculating tables, embracing Survey Section (part i.). 5th edit. (pp. lxxviii. and 172). By J. O. Clancey. Rangoon, 1906. Size 13½ × 8½. *Maps, Diagrams, and Illustrations.* Presented by the Author.  
A well-known work, much used in British India.

### PHYSICAL AND BIOLOGICAL GEOGRAPHY.

**Aeolian Deposits.** **Ivchenko.**  
La stratification dans les dépôts éoliens. Par Alexandre Ivtschenko. (Extrait de l'*Annuaire géologique de la Russie*, tome 10, livr. 1–2.) [Novo Alexandria, 1908.] Size 11 × 9½, pp. 18–29. [In Russian; French *résumé*.]

**Climate and Man.** **Ward.**  
Climate, considered especially in relation to man. By Robert de Courcy Ward. London: J. Murray, 1908. Size 8½ × 5½, pp. xvi. and 372. *Maps and Diagrams.* Price 6s. *net.* Presented by the Publisher.

**Geological History.** **Köhler.**  
Die Entstehung der Kontinente, der Vulkane und Gebirge. Von P. Osw. Köhler. Leipzig: W. Engelmann, 1908. Size 9 × 6, pp. 58. Price 1s. 9d.

**Geomorphology—Mountains.** **Sölch.**  
*Forschungen deuts. Landes- u. Volkskunde* 17 (1908): 118–274.  
Studien über Gebirgspässe, mit besonderer Berücksichtigung der Ostalpen. Versuch einer Klassifikation. Von Dr. Johann Sölch. *Illustrations.*

- Geomorphology—River-banks.** *Ann. G.* 17 (1908): 193-196. **Girardin.**  
 Sur l'allure rectiligne des rives dans les cours d'eau à méandres encaissés, les torrents glaciaires et les lacs de montagne. Par Paul Girardin.
- Geophysics.** *Popular Sc. Monthly* 72 (1908): 492-502. **Huntington.**  
 Coincident activities of the Earth and the Sun. By Dr. Ellsworth Huntington.  
*Diagrams.*  
 Discusses the connection between solar activity and terrestrial phenomena, especially seismic and volcanic.
- Geophysics.** *C.R.A. Sc. Paris* 146 (1908): 1065-1067. **Berget.**  
 Utilisation des failles pour la détermination de la densité moyenne de la terre.  
 Par A. Berget. *Diagram.*  
 The writer suggests that observations of the deflection of the plumb-line in the neighbourhood of vertical fault-scarps might simplify the determination of the mean density of the Earth, but it seems doubtful whether his method is justified.
- Geophysics and Biogeography.** *G.Z.* 14 (1908): 268-274. **Maas.**  
 Bemerkungen zu Simroths Pendulationstheorie. Von O. Maas.  
 The theory was developed last year by H. Simroth in a work of over 500 pages. It supposes a secular swinging of the Earth about an axis passing through Ecuador and Sumatra.
- Hydrology.** *U.S. Geol. Surv., B. No.* 319 (1908): pp. 44. **Fuller.**  
 Summary of the controlling factors of artesian flows. By Myron L. Fuller.  
*Sections and Illustrations.*
- Hydrology.** *Sc. P.R. Dublin S.* 11 (1908): 295-316. **Richardson.**  
 The lines of flow of water in saturated soils. By Lewis F. Richardson. *Diagrams.*
- Hydrology.** *B.S.G. Lyon* 1 (1908): 12-29. **Tessier.**  
 Le déboisement et les inondations. Par L. F. Tessier.
- Ice.** *Nature* 78 (1908): 102-104. **Barnes.**  
 Formation of ground or anchor ice, and other natural ice. By H. T. Barnes.  
*Illustrations.*
- Ice.** **Drygalski.**  
 Beobachtungen an Gletschern und Inlandeis. Von Prof. Dr. Erich von Drygalski.  
 (Sonderabdruck aus Lehrbuch der praktischen Geologie, von Prof. Dr. Konrad Keilhack, Zweite Auflage.) Stuttgart, 1908. Size 9½ × 6½, pp. 268-285.  
 Intended as a guide to observers.
- Limnology—Seiches.** *Petermanns M.* 54 (1908): 33-47, 60-68, 86-88. **Endrös.**  
 Vergleichende Zusammenstellung der Hauptseichesperioden der bis jetzt untersuchten Seen mit Anwendung auf verwandte Probleme. Von Dr. Anton Endrös.  
*Diagrams.*
- Meteorology.** **Scott.**  
 Meteorological Office. The Observer's Handbook. A new and revised edition of Dr. R. H. Scott's instructions in the use of meteorological instruments. London, 1908. Size 9½ × 6, pp. 134. *Map, Illustrations, and Diagrams.*
- Meteorology—Humidity.** *Met. Z.* 25 (1908): 206-215. **Kremser.**  
 Der Einfluss der Grossstädte auf die Luftfeuchtigkeit. Von V. Kremser.
- Meteorology—Instruments.** *Quarterly J.R. Meteorol. S.* 34 (1908): 97-111. **Gold.**  
 Comparison of ships' barometer readings with those deduced from land observations. With notes on the effect of oscillatory motion on barometer readings. By Ernest Gold. *Diagrams.*
- Meteorology—Solar Radiation.**  
 Annals of the Astrophysical Observatory of the Smithsonian Institution. Vol. 2. By C. G. Abbot and F. E. Fowle. Washington, 1908. Size 13 × 9½, pp. xii. and 246. *Diagrams and Illustrations.*  
 Part ii. (pp. 125-201) deals with solar radiation and terrestrial temperature.
- Meteorology—Temperature.** *Met. Z.* 25 (1908): 241-246. **Maurer.**  
 Die Wärmeabnahme mit der Höhe in den Schweizer Alpen. Von J. Maurer.  
 See note, ante, p. 423.  
 No. IV.—OCTOBER, 1908.]

**Meteorology—Upper Air.** *P.R.S., Ser. A. 80* (1908): 530-534. **Malloek.**

Note on the ascent of meteorological balloons and the temperature of the upper air. By A. Malloek. *Diagrams.*

**Meteorology—Winds.** **Platania.**

Giovanni Platania. Le osservazioni del vento in mare e la scala di Beaufort. (Estratto dall'Annuario del R. Ist. Nautico "Duca degli Abruzzi" di Catania, vol. 2, Anno 1908.) Catania, 1908. Size 9 × 6, pp. 25-42. *Illustrations and Diagrams.*

**Morphology—Earth and Mars.** **Merian.**

Mars und Erde: eine vergleichend planetographische Studie. Von E. P. Merian. Basle: F. Reinhardt, 1908. Size 9 × 6, pp. 42. *Maps. Price 1m. 60. Presented by the Publisher.*

The author sees striking resemblances between the major surface features of the Earth and those of Mars.

**Oceanography—Baltic.** **Witting.**

Finnländische hydrographisch-biologische Untersuchungen, No. 2. Untersuchungen zur Kenntnis der Wasserbewegungen und der Wasserumsetzung in den Finland umgebenden Meeren. I. Von Rolf Witting. Der Bottinische Meerbusen in den Jahren 1904 und 1905. Erster Teil. Helsingfors, 1908. Size 12½ × 9½, pp. x. and 246. *Maps, Sections, and Diagrams. Presented by the Author.*

**Oceanography—Pacific.** *G.Z. 14* (1908): 241-250. **Perlewitz.**

Die Gräben im stillen Ozean. Von Paul Perlewitz. *Map and Sections.*

Discusses the features brought to light by the soundings of the *Edi* and *Stephan* (*Journal*, vol. 29, p. 679).

**Oceanography—Relief.** *B.S.G. Italiana 9* (1908): 249-257. **Ricchieri.**

Per la terminologia dei fondi oceanici. Relazione del Prof. G. Ricchieri.

**Physical Geography.** *B.S.G. Italiana 9* (1908): 226-248. **Marinelli.**

Del moderno sviluppo della geografia fisica e della morfologia terrestre. Dal Prof. Olinto Marinelli.

**Rivers and Rainfall.** **Oppokoff.**

Variations périodiques de longue durée du débit et des dépôts atmosphériques dans les bassins fluviaux. Par E. Oppokov. St. Petersburg, 1908. Size 8 × 5½, pp. 40. *Diagrams.* [In Russian; French résumé.]

**Seismology.** *Beiträge Geophysik 9* (1908): 201-236. **Davison.**

The investigation of earthquakes. By Charles Davison. *Diagrams.*

**Tides.** *J. Coll. Sc. Tōkyō 24* (1908): pp. viii. and 114.

An investigation of the secondary undulations of oceanic tides, carried out by the order of the Earthquake Investigation Committee during 1903-1906. *Maps, Illustrations, and Diagrams.*

**Volcanoes—Nomenclature.** *Z. Ges. E. Berlin* (1908): 336-339. **Jaeger.**

Krater, Caldera, and Baranco. Eine Bemerkung zur morphologischen und vulkanologischen Nomenklatur. Von Dr. Fritz Jaeger.

A proposal to apply precise and distinct meanings to the three terms.

#### ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

**Anthropogeography.** *Popular Sc. Monthly 72* (1908): 503-511. **Carney.**

Springe as a geographic influence in humid climates. By Prof. Frank Carney. *Map and Illustrations.*

On the influence of springs on the location of settlements.

**Anthropogeography.** *B. American G.S. 40* (1908): 193-209. **Semple.**

Oceans and enclosed seas: a study in anthropogeography. By Ellen Churchill Semple.

**Commercial.** **Gannett and others.**

Commercial geography. By Henry Gannett, Carl L. Garrison, and Edwin J. Houston. New York (London: G. Philip & Son), [1908]. Size 8½ × 5½, pp. vi., 416, and 30. *Maps and Illustrations. Price 6s. net. Presented by the Publishers.*

**Historical—Age of Discovery.****Grauert and Hartig.**

Die Entdeckung eines Verstorbenen zur Geschichte der grossen Länderentdeckungen. Ein Nachtrag zu Dr. Richard Staubers Monographie über die Schedelsche Bibliothek. Von Dr. Hermann Grauert. Der Brief des Dr. Hieronymus Münzer von 14 Juli 1493 über die Westfahrt nach Kathay in portugiesischen Druckausgaben. Von Dr. Otto Hartig. (Aus dem Historisches Jahrbuch der Görres-Gesellschaft, Bd. xxix., 1908.) Size  $9 \times 5\frac{1}{2}$ , pp. 304-337. Presented by Dr. O. Hartig.

The late Dr. Stauber, during the preparation of a monograph on the Library of the fifteenth-century chronicler Hartmann Schedel (compiler of the 'Nuremberg Chronicle'), brought to light some interesting data bearing on the Portuguese discoveries of that century.

**Historical—Cartography.****Denucé.**

Les origines de la cartographie portugaise et les cartes des Reinel. Par Jean Denucé. Ghent, 1908. Size  $9\frac{1}{2} \times 6\frac{1}{2}$ , pp. viii. and 138. Facsimile maps.

**Historical—Cartography. Riv. G. Italiana 15 (1908): 65-77, 135-148. Magnaghi.**

L'Atlante manoscritto di Battista Agnese della Biblioteca Reale di Torino. Del Prof. Alberto Magnaghi.

**Historical—Drake's Voyage.****Davidson.**

T. and P.G.S. Pacific 5 (1908): pp. iv. and 114.

Francois Drake on the north-west coast of America in the year 1579. The Golden Hinde did not anchor in the bay of San Francisco. By George Davidson.

**Historical—Levant Company.****Epstein.**

The early history of the Levant Company. By Dr. M. Epstein. London: Routledge & Sons, [1908]. Size  $8 \times 5$ , pp. x. and 270. Price 2s. 6d. net. Presented by the Publishers.

**Historical—Ophir.****Peters.**

Ophir nach den neuesten Forschungen. Von Dr. Carl Peters. Berlin: E. Felber, 1908. Size  $8\frac{1}{2} \times 5\frac{1}{2}$ , pp. 36. Price 1m. Presented by the Publisher.

**History of Geography.****Bellemo.**

Vincenzo Bellemo. La cosmografia e le scoperte geografiche nel secolo xvi. e i viaggi di Nicolo de Conti. Padua, 1908. Size  $9 \times 6$ , pp. 372. Presented by the Author.

**BIOGRAPHY.****Pombal.****Aranha.**

O Marquez de Pombal e o seu centenário. Notas bio-bibliográficas . . . por Brito Aranha. Lisbon, 1908. Size  $9 \times 6$ , pp. 182. Portrait and Illustrations. Presented by the Lisbon Geographical Society.

**Spilbergen. Ts. K. Nederland. Aardr. Genoots. 25 (1908): 513-550. Wichmann.**

Joris van Spilbergen, 1568-1620. Door Arthur Wichmann. Facsimile Illustration.

The text of this dissertation is the recent Hakluyt Society edition of the voyages of Spilbergen and Le Maire, which the writer considers to do imperfect justice to its theme.

**Towson.**

Globus 93 (1908): 325-330, 346-351, 363-366.

**Seidel.**

Robert Towson, ein Tatraforscher des 18 Jahrhunderts. Von H. Seidel. Illustrations.

**GENERAL.****Berlin Geographical Society. Z. Ges. E. Berlin (1908): 369-376, 396-402.**

Fest-Sitzung zur Feier des 80-jährigen Bestehens der Gesellschaft für Erdkunde zu Berlin am 28. Mai 1908. Ansprache des Vorsitzenden. [Dr. Herr Hellmann.] Verkündigung der Ehrungen. Also separate copy (size  $10 \times 6\frac{1}{2}$ ).

**British Empire—Cotton.**

The British Cotton Growing Association. Third annual report for the sixteen months ending December 31st, 1907. Manchester, 1908. Size  $8\frac{1}{2} \times 5\frac{1}{2}$ , pp. 40. Map and Illustrations.

**Early Work on Cosmography.****Waldseemüller and Wieser.**

Die Cosmographia Introductio des Martin Waldseemüller (Ilacomilus), in Facsimiledruck herausgegeben mit einer Einleitung von Fr. R. v. Wieser. Strassburg: J. H. Ed. Heitz, 1907. Size  $8\frac{1}{2} \times 6\frac{1}{2}$ , pp. 30 and 104. *Facsimile Diagrams.* Price 10m.

An excellent facsimile reproduction of the whole work.

**Education.***M. k. k. G. Ges. Wien* 51 (1908): 91-125.**Hödl and others.**

Fachsitzung am 17. Februar 1908 betreffend den geographischen Unterricht an Mittelschulen. [Address by Dr. Roman Hödl, and discussion.]

**Educational.****Hubbard.**

College geography. By George D. Hubbard. (Reprinted from the *Educational Review*, New York, April, 1908.) Size  $9\frac{1}{2} \times 6$ , pp. 381-400.

**Educational—Text-book.****Johnston and Keane.**

A physical, historical, political, and descriptive geography. By Keith Johnston. 6th edit. Revised by Dr. A. H. Keane. London: E. Stanford, 1908. Size  $8 \times 5\frac{1}{2}$ , pp. xiv. and 492. *Maps and Diagrams.* Price 12s. *Presented by the Publisher.*

This well-known text-book appears in essentially the same guise as in the earlier editions, the revision having been restricted to matters of detail.

**Educational—Text-book.****Lyde.**

A school text-book of geography. By Lionel W. Lyde. London: A. & C. Black, 1908. Size  $7 \times 4\frac{1}{2}$ , pp. xii. and 410. *Sketch-maps and Diagrams.* Price 3s. 6d. *Presented by the Publishers.*

**Geography.***B.S.G. Lyon*, 2 Sér. 1 (1908): 1-11.**Martonne.**

Le développement et l'avenir de la géographie. Par E. de Martonne.

**NEW MAPS.**By E. A. REEVES, *Map Curator*, R.G.S.**EUROPE.****British Islands—England and Wales.****Ordnance Survey.**

Sheets published by the Director-General of the Ordnance Survey, Southampton, from August 1 to 31, 1908.

1-inch (third edition):—

With hills in brown or black, 112, 118, 114, 115, 116, 141, 143, 166, 176, 201, 292, 293. 1s. each (engraved).

Large-sheet series, printed in colours, folded in covers or flat in sheets, 43, 52, 60. Price, on paper, 1s. 6d.; mounted on linen, 2s.; mounted in sections, 2s. 6d. each.

6-inch—County Maps:—

**Cornwall** (First Revision), 62 s.e., 64 n.w., 65 n.w., 69 n.e., 70 n.w., 80 s.w. **Kent** (Second Revision), 44 s.e., 63 s.e., 64 s.e., 67 s.w., 81 s.e. **Yorkshire** (First Revision of 1891 Survey), 219 s.e., 220 s.e., 221 s.w., s.e., 230 s.e., 231 s.e., 232 n.e., s.w., 234 n.e., s.e., 235 s.e., 237 n.w., 245 n.w., 249 n.e., 253 s.e.

25-inch—County Maps:—

**Hampshire** (Second Revision), LXXXI. 6, 7, 8, 11, 12, 14, (15 and 16); LXXXII. (5 and 9), (13 and 14); LXXXIX. 2, (8, 4 and 7), 12; XC. 5, 7, 8, 9, 10, 11, 12, 13, 15, 16; XCV. 1, 12, 16; XCVI. 1, 2, 3, 5, 7, 9, 11, 12, 13, 15; XCVII. 12; XCVIII. 4, 8, 13; XCIX. 1, 2, 9, 13; C. 1, 3, 4. **Kent** (First Revision), V. 13; XI. 2, 3; XVIII. 7, 15; XX. 2, 14; XXX. 3, 15; XXXII. 14; XXXIII. 13; XLII. 10, 16; XLIII. 10, 14; XLIV. 5; LII. 5, 9, 14; LIII. 3; LXII. 14; LXIII. 1, 9, 13; LXXI. 1. **Lancashire** (First Revision of 1891 Survey), LXXXII. 12, 15; LXXXIII. 16; XCI. 2, 3, 7, 8, 9, 11, 13, 15, 16; XCII. 8, 9, 10; XCVIII. 4, 8, 12; XCIX. 1, 5, 6, 7, 8, 9, 11, 15, 16; CI. 1, 13; CIII. 6, 10; CIV. 1, 2, 3, 5, 7, 8; CVI. 3, 7, 8; **Pembrokeshire** (First Revision), XXXIII. 10, 13; XXXIX. 2, 6,

13; XI. 2, 9; Yorkshire (First Revision of 1891 Survey), CLXXXI. 8, 11, 16 (1s. 6d.); OCII. 4, 8, 12, 16; OCIII. 5, 9, 11, 13, 14; CCXVI. 1, 2, 4, 8; CCXVIII. 6. 3s. each.

(*E. Stanford, London Agent.*)

#### British Islands—Scotland.

Bartholomew.

Bartholomew's District Plan of Glasgow. Scale 1 : 25,000 or 2·5 inches to 1 stat. mile. Edinburgh: J. Bartholomew & Co., [1908]. Price 2s. mounted on cloth. Presented by the Publisher.

#### Europe.

Andrews and Dickinson.

Macmillan's Orographical Map of Europe. Designed by A. W. Andrews, M.A., and B. B. Dickinson, M.A. Scale 1 : 4,000,000 or 1 inch to 63·1 stat. miles. With Notes. London: Macmillan & Co., [1908]. Price, mounted on rollers and varnished, 15s.; Notes, 1s. Presented by the Publisher.

The relief is shown on this map by the ordinary colour-tinting system in a series of six shades of green, yellow, and brown, ranging from land below sea-level to over 6000 feet in altitude. Ocean depths are indicated by tints of blue at intervals of 100, 500, 1000, and 2000 fathoms. The intervals selected to show land relief, generally speaking, bring out the leading features of the great natural divisions of the continent fairly satisfactorily, but owing to the fact that the tint is the same between sea-level and 600 feet, the characteristic features of certain districts are almost lost, and perhaps it might have been an advantage if the high peaks had been indicated in some special manner instead of showing all land above 6000 feet by the same tint. Very properly there are but few names, and those that are given are small, so that the physical features are not obliterated, and stand out clearly when the map is hung on the wall of a classroom. Accompanying the map is an instructive little pamphlet of thirty pages, in which the various natural divisions of Europe, as shown on the map itself, are described. This also contains useful hints to teachers on the use of the map.

#### Sweden.

Generalstabens Litografiska Anstalt, Stockholm.

Generalstabens Karta öfver Sverige. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheets: 63, Umeå, n.o.; 63, Umeå, s.o.; 64, Holmön, n.v.; 64, Holmön, s.v.; 68, Sollefteå, n.v.; 80, Brämö, n.v.; 80, Brämö, s.v. Scale 1 : 200,000 or 1 inch to 3·2 stat. miles. Sheet 80, Brämö. Stockholm: Generalstabens Litografiska Anstalt, 1907-08. Presented by the *Chef du Service Topographique, Stockholm.*

### ASIA.

#### Indo-China and Siam.

Commission de Délimitation entre l'Indo-Chine et le Siam.

Carte de la Commission de Délimitation entre l'Indo-Chine et le Siam. Scale 1 : 200,000 or 1 inch to 3·2 stat. miles. Sheets: Mekrat, Grand Lac, Phnom Coulen, Dangrek, Khong, Bassac, Nam Heung, Pak-Lay, McNan, Haut Mé-Nam, Mekhop—MeXiang Lom. Paris: Henry Barrère, [1908]. Presented by the Publisher.

An important map of the frontier region between Indo-China and Siam, constructed from the recent surveys of French officers attached to the commission for the delimitation of this boundary. The basis of the map is a system of triangulation, and carefully observed and computed latitudes and azimuths wherever these could be obtained. As regards longitude four methods were employed: first, difference of longitude computed from the astronomical azimuths; second, route traverses checked by latitudes; third, by transport of chronometers around closed traverses; fourth, absolute longitudes depending on the moon's movement, repeated in the same place. The first method was wisely adopted as far as possible. The latitudes were computed in five different ways, and the probable error of these observations, as well as that of the longitudes depending upon the azimuths, is stated to be less than five seconds of arc. It is evident that great care has been taken to provide as good a basis for this map as possible under the circumstances. The topographical features have been filled in by plane-table, or, where the country was not suitable for using this instrument, by traverses adjusted to fixed positions.

The sheets measure 17 inches by 25 inches, and are carefully drawn and printed in colours, land elevations being shown by contours, more or less approximate, at intervals of 50 metres.

## AFRICA.

## Egypt.

Survey Department, Cairo.

Topographical map of Egypt. Scale 1:50,000 or 1·6 inch to 1 stat. mile. Sheets: N.E. III.-II., Mina el Qamh. S.E. IV.-I., Wasta; IV.-II., Masged Musa; V.-I., Beni Suef; VI.-I., El Baranqa. S.W. III.-III., Qasr Qarun; IV.-III., Bahr el Wakil; VI.-I. and II., Beba; VII.-I., Maghagha; VII.-II., Barmasha; VIII.-I., Beni Mazar; VIII.-II., Bardanuha. Cairo: Survey Department, 1908. *Presented by the Director-General, Survey Department, Cairo.*

## Gold Coast.

Guggisberg.

Map of the Gold Coast. Published by the authority of Sir John Pickersgill Rodger, K.C.M.G., Governor, under the direction of Major F. G. Guggisberg, R.E., F.R.G.S., Director of Surveys, Gold Coast. Scale 1:125,000 or 1 inch to 1·9 stat. mile. Sheets: 72-I-II., Debiso; 72-I-IV., Dadiaso; 72-J-III., Asafo; 72-O-II., Yaon; 72-O-IV., Newtown; 72-P-I., Enchi. Edinburgh and London: W. & A. K. Johnston, Ltd., 1908. *Price 2s. each sheet. Presented by Major F. G. Guggisberg, R.E., Director of Surveys, Gold Coast.*

## Morocco.

Larras.

Cartes de Reconnaissance du Maroc levées et dessinées par le Capitaine N. Larras, 1898-1906. Scale 1:250,000 or 1 inch to 3·9 stat. miles. Sheets: Fes; Mazagan. Paris: Henry Barrère, [1908]. *Presented by the Publisher.*

In addition to the usual topographical features and route surveys, these sheets contain plans of Rabat-Salé (1:30,000) and Mazagan (1:10,000). The positions of wells and cisterns, and other information useful for travellers, have been carefully noted.

## Morocco.

Service Géographique de l'Armée, Paris.

Carte du Maroc. Scale 1:500,000 or 1 inch to 7·9 stat. miles. Sheets: 3, Oudjda; 5, Oued Charef. Paris: Service Géographique de l'Armée, 1906-7. *Price 1 fr. each sheet.*

Two sheets of a large-scale coloured map of Morocco of which the publication was commenced two years ago. The present sheets include Melilia and the country to the south and east as far as the frontier of Algeria.

## Togo.

Sprigade.

Karte von Togo. Bearbeitet von P. Sprigade. Scale 1:200,000 or 1 inch to 3·2 stat. miles. Sheet C 2, Sokodé. *Mitteilungen aus den deutschen Schutzgebieten.* Band xxi., 1908, Karte 7. Berlin: E. S. Mittler & Sohn, 1908. *Presented by Dietrich Reimer's Geographical Establishment, Berlin.*

The second revised edition of the sheet published in August, 1905. The geographical results of several additional route surveys have been added.

## AMERICA.

## Canada.

Department of the Interior, Ottawa.

Sectional Map of Canada. Scale 1:190,080 or 1 inch to 3 stat. miles. Sheets: 20, Souris, revised to May 12, 1908; 24, Lake of the Woods, revised to May 12, 1908; 170, Yorkton, revised to February 19, 1908; 220, Nut mountain, revised to December 11, 1907. Ottawa: Department of the Interior, Topographical Surveys Branch, 1907-1908. *Presented by the Department of the Interior, Ottawa.*

## Canada.

Department of the Interior, Ottawa.

Map of the Dominion of Canada. Scale 1:6,336,000 or 1 inch to 100 stat. miles. Ottawa: Department of the Interior, 1908. *Presented by the Department of the Interior, Ottawa.*

## Canada.

Topographical Section, General Staff.

Map of Canada. Scale 1:126,720 or 1 inch to 2 stat. miles. Sheet: Niagara peninsula, Ontario. London: Topographical Section, General Staff, War Office, 1908. *Price 2s. 6d. each sheet. Presented by the Director of Military Operations.*

A sheet of the new topographical map of Canada, based on surveys carried out by the Canadian Department of Militia and Defence. There are two editions of the sheet, one showing hill features by contours in brown at 25-foot intervals, and another indicating the relief of land by twelve different shades of brown at intervals of 50 feet from 200 feet to 900 feet. The area included extends from Lake Ontario in the north to Lake Erie in the south, while the Niagara river and the towns upon it, with the falls, form the eastern limit, and Hamilton and Caledonia the western. The sheet will be most useful to tourists and others visiting the district.

## PACIFIC OCEAN.

## Caroline Islands.

Krämer.

Karte von Babeldaob nach provisorischen Aufnahmen von A. Krämer. Scale 1:225,000 or 1 inch to 3.5 stat. miles. Politische Uebersichtskarte der Yap-Inseln mit den von A. Krämer ermittelten Namen. Scale 1:150,000 or 1 inch to 2.4 stat. miles. *Mitteilungen aus den deutschen Schutzgebieten*, Band xxi., 1908, Karte 10. Berlin: E. S. Mittler & Sohn, 1908. Presented by Dietrich Reimer's Geographical Establishment, Berlin.

These are maps of the two principal islands in the Pelew and Caroline groups in the possession of Germany. They contain a considerable amount of new information, although the surveys from which they were drawn are considered as provisional only.

## CHARTS.

## Admiralty Charts.

## Hydrographic Department, Admiralty.

Charts and Plans published by the Hydrographic Department, Admiralty, during July, 1908. Presented by the Hydrographer, Admiralty.

## New Charts.

No.	Inches.	
2268 m =	{ 9.0 14.2 }	England, south coast:—Portland harbour. Plan:—Portland coaling piers. 3s.
3703 m =	2.4	France, west coast:—Baie de Quiberon. 2s.
1685 m =	{ 0.3 and var. }	Greece:—Venetico island to Spezzia island, including the channels between Cape Malea and Crete. Plans:—Kapsali bay, Port Asomato, Port Potamo, Port Vathy, St. Nikolo bay. 3s.
3201 m =	{ 1.78 3.60 }	Iceland:—Approaches to Hafnarfjord and Reykjavik. Plans:—Hafnarfjord, Reykjavik harbour. 3s.
1127 m =	6.0	Canada, river St. Lawrence:—Montreal harbour. 3s.
3697 m =	1.3	Philippine islands:—Lucena anchorage, Pagbilao bay and Port Laguimanok. 2s.
1741 m =	3.0	China:—Chu kiang or Canton river, Sheet II.:—Langkit spit to Tiger island, including Chuen pi and Boca channels. 3s.
174 m =	{ 0.38 and var. }	New Hebrides:—Banks group. Plans:—Milli bay, Avreas bay, Lakona bay, Losolav anchorage, Masevonu anchorage. 2s.

## New Plans and Plans added.

102 m =	17.7	England, east coast:—Pakefield Gateway to Orfordness. Plan added:—Southwold harbour, 2s. 6d.
3220 m =	13.2	France:—Cape Ferrat to Bordighera. Plan added:—Port Monaco. 4s.
106 m =	3.6	Sardinia. Palmas bay. Plan added:—Port Teulada. 2s.
1129 m =	3.6	Sardinia:—San Pietro channels, etc. New Plan:—Port Mal-fatano. 2s.
1556 m =	2.6	Ægean sea. Gulf of Volo with Oreos and Talanta channels. Plan added:—Abillion anchorage. 4s.
957 m =	3.0	Ports in the Philippine islands. Plan added:—Agusan river entrance. 2s.
1414 m =	2.5	Anchorage in the Solomon islands. Plan added:—Neal island anchorage. 3s.

## Charts Cancelled.

No.		
2268	England, south coast:—Portland harbour, Portland coaling piers.	New chart. Portland harbour, Portland coaling piers 2268
2609	France:—Rade d'Agay to San Remo, Plan of Port Monaco on this sheet.	New plan. Port Monaco on chart . . . . . 3220
1685	Greece:—Venetico to Cape Malea with the island of Cerigo. Plans:—Kapsali bay, Port St. Nikolo, Port Vathy, Port Asomato, Port Potamo.	New chart. Venetico island to Spezzia island, including the channels between Cape Malea and Orete. Plans:—Kapsali bay, Port Asomato, Port Potamo, Port Vathy, St. Nikolo bay . 1685

2738 Iceland:—Portland to Snefells Jökul. Plan of Reykjavik and adjacent inlets on this sheet.	New chart.
3201 Iceland:—Reykjavik harbour.	Approaches to Hafnarfjord and Reykjavik. Plans:—Reykjavik harbour, Hafnarfjord 3201
1127 Canada, River St. Lawrence:—Montreal harbour.	New chart.
2395 Ports in the Philippine islands:—Plan of Laguimanok bay on this sheet.	Montreal harbour . . . . . 1127
1741 China: Canton river, sheet II.:—Langkit spit to Tiger island, with Chuen pi and Boca channels.	New chart.
856 Anchorages in the New Hebrides:—Plans of Masevonu and Losolav anchorages on this sheet.	Lucena anchorage, Pagbilao bay, and Port Laguimanok . . . . . 3697
174 New Hebrides. Banks group:—Milli bay, Avreas bay, Lakona bay.	New chart.
	Chu kiang or Canton river, sheet II., Langkit spit to Tiger island, including Chuen pi and Boca channels . . . . . 1741
	New chart.
	Banks group:—Milli bay, Avreas bay, Lakona bay, Losolav anchorage, Masevonu anchorage . . . . . 174

### Charts that have received Important Corrections.

No. 1859, England, west coast:—King road. 3648, Africa, west coast:—Junk river to Ceatos bay. 815, Ceylon:—Trincomali harbour and bays. 3588, China:—Canton river delta. 3026, China:—Macao to Pedro Blanco, including Hong Kong. 2412, Japan:—Amoy to Nagasaki. 3531, Tasmania:—Entrance to Macquarie harbour. (*J. D. Potter, Agent.*)

**Chile.** **Oficina Hidrografica, Valparaiso.**  
 Chilean Hydrographic Charts, Nos. 117, Tierra del Fuego, Canal Beagle; 137, Magallanes, Bahia Porvenir; 141, Coquimbo, Bahia Choros e islas adyacentes; 143, Tierra del Fuego, Paso Timbales, Canal Beagle. Valparaiso: Oficina Hidrografica, 1907-08. *Presented by the Chilean Hydrographic Office.*

**Indian Ocean and Red Sea.** **Meteorological Office.**  
 Monthly meteorological charts of the Indian Ocean north of 15° S. lat. and Red Sea, September, 1908. London: Meteorological Office, 1908. *Price 6d. each. Presented by the Meteorological Office.*

**North Atlantic and Mediterranean.** **Meteorological Office.**  
 Monthly meteorological charts of the North Atlantic and Mediterranean, September, 1908. London: Meteorological Office, 1908. *Price 6d. each. Presented by the Meteorological Office.*

**North Atlantic.** **U.S. Hydrographic Office.**  
 Pilot chart of the North Atlantic Ocean, August, September, 1908. Washington: U.S. Hydrographic Office, 1908. *Presented by the U.S. Hydrographic Office.*

**North Pacific.** **U.S. Hydrographic Office.**  
 Pilot chart of the North Pacific Ocean, September, 1908. Washington: U.S. Hydrographic Office, 1908. *Presented by the U.S. Hydrographic Office.*

**N.B.**—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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# The Geographical Journal.

No. 5.

NOVEMBER, 1908.

VOL. XXXII.

## **SOME GEOGRAPHICAL ASPECTS OF THE NILE.\***

**By Captain H. G. LYONS, F.R.S., F.R.G.S., Director-General of the Survey  
Department of Egypt.**

THE geographical exploration of the basin of the Upper Nile was actively prosecuted during the second half of the last century, but the Mahdist rebellion closed this region to travellers in 1884, and for the next fifteen years but little could be done. In 1899 the capture of Omdurman and the defeat and dispersal of the Dervish forces once more opened the southern Sudan to European activity. In the mean time Egypt, under a stable government and an efficient organization, had increased marvellously in economic prosperity. Improvements in the irrigation system enabled the cultivator to receive regularly the water which he required, and the construction of the Aswan reservoir furnished a supply of water which sufficed, with strict economy, to meet the most pressing needs of the country and its rapidly increasing cultivation during the low stage of the river. But more water was necessary if the waste lands on the northern margin of the delta were to be reclaimed and cultivated. The Blue Nile, which falls rapidly in the autumn months, was obviously useless for this purpose, so that the study of the White Nile and its tributaries was the first step towards the solution of the problem.

During the past nine years much has been done in this direction, and now the main characteristics of the various portions of the river system have been ascertained. It may be of interest, therefore, briefly to lay the results before the Society.

In Egypt, from the earliest period of antiquity, the annual flood of the Nile was recognized as the most important phenomenon of the

\* Read at the Royal Geographical Society, June 29, 1908. Map, p. 548.  
No. V.—NOVEMBER, 1908.]

year, and it attracted the attention of the dwellers in the valley both on account of its importance to them and from its occurrence in a region where the climate is practically rainless. According to Herodotus, the ancient Egyptians considered the river as flowing from two springs in the neighbourhood of Philæ island at the head of the first cataract, although this legendary source cannot have coincided with their experience, since from very early times they were acquainted with its Nubian valley, and therefore knew that the true sources lay to the south of this again. But these southern regions were poor and inhospitable as compared with the fertile flood-plain and delta of Egypt, and beyond raiding them for slaves and cattle and levying a tribute upon the inhabitants, the Egyptians interested themselves but little in the upper reaches of the river.

In the course of the eighteenth century the sources of the Blue Nile were discovered, and the cause of the annual flood was correctly determined to be the summer rainfall on the tableland of Abyssinia. In the nineteenth century the White Nile was traced to the lakes of the equatorial plateau, and the geography of its basin was sufficiently elucidated to enable Lombardini, in 1865, to sketch out the broad lines of the hydrography of the Nile.

During the last quarter of the nineteenth century the rapid increase of prosperity in Egypt, which was due to the establishment of order in the country and the introduction of administrative reforms, directed attention to the lower reaches of the river, while the Mahdist rebellion closed the Sudan to travellers. The irrigation of the country had been organized and developed so that not only were large areas of waste land brought under cultivation, but land which formerly bore but one crop in the year, produced two and even three when the water of the Nile was supplied regularly throughout the year instead of at the time of the inundation only. But at the same time that the demands of the cultivator have been constantly increasing, Egypt has experienced an unusual shortage of water, caused by the long series of exceptionally low floods which have occurred of late years, one alone since that of 1896 having been above the average, so that great difficulty has been experienced in furnishing the quantity of water needed for the crops.

The valuable cotton crop, which is sown in March and April, and which is picked in September and October, needs a regular supply of water in May, June, and July, when the river is at its lowest and the flood has not yet arrived; consequently, the irrigation engineers have been compelled to husband the water in every available way that could be devised, in order to meet as far as possible the requirements of the early summer months. But a larger supply was urgently needed, and directly Omdurman had been taken and the Mahdist rebellion had been crushed, the investigation of the upper Nile was vigorously pushed forward in order to see how the low-stage supply of the river could be

be increased. To these needs we owe the great addition to our knowledge of the regimen of the Nile and its tributaries which has been gained during the last eight years.

Many of the views which were formerly held have been modified as new information was accumulated, but we may now say with some confidence that the regimen of the basin is well known in its broad outlines, and although much detailed work remains to be done, although many lines of investigation are as yet almost untouched, it is possible now to describe the more striking geographical characteristics of the river, and to indicate some of the deficiencies in our knowledge which those who have opportunity for observation may be inclined to make good.

There are three principal and characteristic factors of the Nile regimen which exercise a marked effect upon it as a whole, and influence to a greater or less degree each portion of the river-system; but each portion also has its own peculiarities, which may greatly alter its reach of the river, and may produce effects which in turn influence other areas. It will be convenient to deal first with those factors which are of wider influence, and afterwards with those which affect a more limited area. Of the former there are three—

Firstly, the plateau of the equatorial lakes and the Abyssinian plateau—for both of these receive a heavy rainfall and supply the whole of the water which is carried by the Nile and its tributaries, that which falls on the Sudan plains being so little that it may be considered to be practically negligible as a source of supply for the river; secondly, the rainless, or at least arid, conditions which prevail over a very large proportion of the basin, since even over the greater portion of the Sudan plains precipitation is very moderate in amount; thirdly, the very low slope of the basin, which is such that an altitude of 1500 feet above sea-level is not reached on the White Nile until a point 3000 miles from the Mediterranean near Gondokoro.

Though each portion of the river has its own peculiar character, these three factors, a heavy localized rainfall, aridity in other parts of the basin, and a valley of low slope, are those which exert the greatest and widest influence.

When we begin to study the basin of the Nile as it is presented to us to day in the latest maps and in the descriptions penned by travellers in recent years, we find that in some respects this great river departs from the normal type, and exhibits peculiarities which it is of interest to investigate. Rivers have usually a steep slope near their source, which gradually becomes less as lower levels are reached, and the eroding power of the water diminishes; beyond this follows a region of deposition, where the inclination of the valley is very slight, and the river flows slowly through alluvial plains which it has formed in the course of ages; but this plain tract occurs in the Nile system at

two very distant points, the valleys of the Bahr el Jebel and the White Nile, and the valley of Egypt.

If we consider the longitudinal section of the Nile, which has now been levelled from the Mediterranean to the Victoria lake (with the exception of two short reaches, together not more than 140 miles in length out of a total length of about 3500), we find that both the Victoria Nile and the Semliki river descend very rapidly from the equatorial plateau in several series of rapids, interrupted by level reaches, until Gondokoro or Mongalla on the Bahr el Jebel. Then there follows a length of 1060 miles in which the river falls only 180 feet, or at the average rate of only 2 inches per mile. Beyond this point the slope again increases, and the river descends some 800 feet in 1200 miles in passing the several cataracts between Khartum and Aswan, after which it flows through Egypt, with a fall of from 5 to 6 inches per mile. Thus there is first an unnavigable portion, then a long and easy waterway which is separated by the cataract portion, which is partially navigable, from the valley of Egypt where the Nile has furnished the best means of communication. The comparatively recent movement of blocks of the Earth's crust on the equatorial plateau is shown by the very moderate amount of weathering which has as yet taken place, and by the very incomplete development of the drainage systems there; lakes, marshes, and river reaches of low slope, which are choked with reeds and water-plants, alternate with rapids and rocky stream-beds, down which the water rushes to deposit its load of detritus in another lake or plain-tract lower down. In this way the water which flows over the Ripon falls pours down 60 miles of rapids, and then joins the still waters of Lake Choga; at Foweira 50 miles of rapids begin, which end at the Murchison falls, 120 feet high; and immediately beyond these the material eroded from the rocky bed and brought in by tributary streams is forming extensive mud flats where the Victoria Nile enters Lake Albert. The Semliki river, after flowing northwards for some 50 miles from Lake Albert Edward, plunges down a series of rapids until it reaches the level of the Albert lake. Thus far, then, the Nile may be said to be in its mountain tract, as it scours its way down the gorges which it is carving out in the masses of granite and gneiss which form the plateau. One hundred and thirty miles beyond the Albert lake the Nile again plunges down 90 miles of rapids, the last step of the lake plateau, after which it flows gently through the plains of the Sudan.

The Sobat, the Blue Nile, the Atbara, and the Mareb, or Khor el Gash, all rise on the Abyssinian plateau at altitudes of from 6000 to 8000 feet above sea-level, and pour down their deep-cut gorges until they reach the plains of the Sudan, where they have excavated meandering channels in the alluvial plain.

The quantity of water supplied by these two great gathering-grounds

would be very large but for certain geographical conditions which reduce that from the equatorial plateau to an almost constant supply of about 12,000 or 14,000 cubic feet per second, while the Abyssinian rivers, on the other hand, must furnish about half a million cubic feet per second in a high flood.

In the majority of rivers the volume of water which they discharge increases from a very small amount near their sources to a maximum near the point where they empty themselves into the sea or an inland lake. With the Nile it is quite otherwise; not only has its volume a very marked seasonal change of volume, but from point to point of its course it varies greatly, now increasing and now decreasing as local conditions affect it. The maximum is reached when the Atbara joins the Nile, and from this point onwards, the volume diminishes by evaporation, seepage, and by the utilization of the water by the agricultural population of Egypt. The whole of this supply is furnished by a seasonal rainfall, which oscillates during the year from about  $15^{\circ}$  south of the equator to  $15^{\circ}$  north of it; in January British Central Africa receives its heaviest rainfall; in Uganda, the spring maximum occurs in April and May, while during July and August 60 per cent. of the year's rain falls on the Abyssinian plateau; in the autumn the rain-belt travels southward, again passing the equator about November, and reaching its southern limit in January. Thus the equatorial plateau has two rainy seasons and two dry seasons, while the Abyssinian plateau and the Sudan plains have a single rainy season in the summer months. North of Berber practically no rain falls, and that which the northern part of the Delta receives in winter does not reach the river.

The supply effectively furnished to the river at different points by this rainfall is shown in Fig. 1, where each division of the vertical scale represents a discharge of 35,300 cubic feet (1000 cubic metres) per second. Each of the discharge curves south of Dueim depends on a few measurements only, but the diagrams for these stations have been corrected as far as possible with the aid of the daily gauge readings; those for Dueim, Khartum, Atbara, and Wadi Halfa are from numerous actual measurements. The flood of the year 1903, which these diagrams represent, was in volume 11 per cent. below an average flood at Aswan.

The diagram is exceedingly instructive, for we see that, while the change of level of the Victoria lake makes but little difference to the discharge, a very marked seasonal variation occurs at the Murchison falls, where the low-stage volume is about 21,000 cubic feet per second, compared with 56,000 in flood, and this increase is due to the July–November rainfall on the northern edge of the plateau, since up-stream of Foweira the water-level of the Victoria Nile varies but little. At Wadelai the level varies with that of the Albert lake, and the discharge shows a maximum towards the end of the year. At Gondokoro there is a well-marked maximum in September corresponding to

that already noted at the Murchison falls, and is, like it, due to the rainfall on the northern edge of the plateau. But little of this water ever reaches the White Nile, for as the level of the Bahr el Jebel rises, the plains of the valley are flooded, and the discharge into Lake No, 500 miles to the north, hardly varies throughout the year. This 12,000 cubic feet per second represents the whole of the effective

#### VOLUME DISCHARGED BY THE NILE.

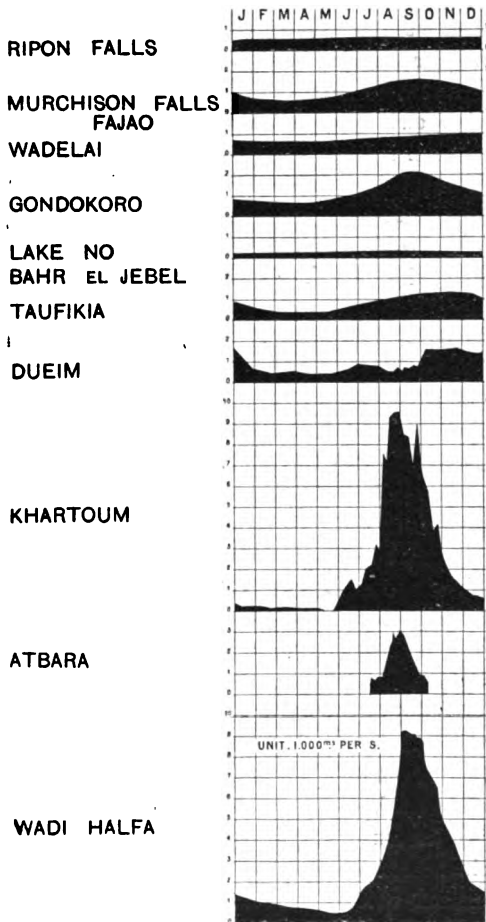


FIG. 1.

the Sobat—that is to say, from about 14,000 cubic feet per second as a minimum to about four times that amount in flood time. But the slope of this portion of the Nile is so low that the flood water of the Blue Nile ponds back that of the White Nile, and so long as the former is discharging more than 180,000 cubic feet per second but

supply furnished to the White Nile by the rainfall of the equatorial plateau, approximately one-tenth per cent. of the rainfall. The Bahr el Ghazal and the Bahr el Zaraf together contribute from one-sixth to one-third of that furnished by the Bahr el Jebel, and their combined discharge represents the whole of the supply which is not derived from the Abyssinian plateau.

In the Sobat river we have the effect of the Abyssinian rains, but the maximum is only reached in December, owing to the delaying effect of the plains of the Pibor river, which are flooded by the summer rains, and are only drained off gradually.

The White Nile carries the volume supplied by the Bahr el Jebel, Bahr el Zaraf, and Bahr el Ghazal, together with whatever is supplied by

little of the White Nile water passes forward ; it floods its own valley, forming a reserve supply, which drains off in November and December when the level of the Blue Nile has fallen. Thus the equatorial plateau has no effect whatever on the flood in the Nile valley north of Khartum, but furnishes the bulk of the low-stage supply.

From Khartum northwards the discharge diagram takes a wholly different form, for the Blue Nile is fed by the rains of Abyssinia, which are strictly limited to a short season, and may be considered as almost restricted to the months of June, July, August, and September, in which fifteen per cent., thirty per cent., thirty per cent., and fifteen per cent. of the year's rainfall occur respectively. Consequently the river rises rapidly to its maximum level, which it reaches at the beginning of September, and then falls almost as rapidly. The Atbara is supplied by the same rains, and has a similar regimen, but falls somewhat earlier, so that the maximum level at Wadi Halfa and Aswan is also reached in an average year at the beginning of September.

The Wadi Halfa diagram shows the resultant effect of the two sources of supply—the Blue and White Niles. At the beginning of the year the discharge of the Blue Nile has diminished to a very small amount ; the Sobat is furnishing a considerable supply to supplement the constant volume delivered by the Bahr el Jebel, and to increase the water which had been stored in the White Nile valley, and which is now rapidly running off. From this time until May the volume of the Blue Nile and that of the Sobat decrease rapidly, the water stored in the White Nile has drained off by the end of January, and all that is available for Nubia and Egypt is the water from the equatorial plateau supplemented by such small supply as the Sobat and the Blue Nile may still bring down, as well as by a certain amount which drains back into the river from the flood plains and the sandstone which forms the valley sides. This then is the time of Egypt's greatest need, and increasing cultivation has necessitated the construction of reservoirs and regulating dams by means of which the surplus water of November and December can be stored up and supplied during the period of deficiency which lasts through May, June, and July. It is easy to see now what will cause deficiency in the low-stage supply, since that which arrives from the equatorial plateau is constant throughout the year ; weak rains in Abyssinia, which end earlier in the autumn than usual, will cause the Sobat and the Blue Nile to fall to their minimum early in the spring months ; the low flood will have held up less water in the White Nile valley, so that the variable sources of supply will be much reduced. If such a state of things occurs in successive years the water-table of the valley will fall, and this also will act prejudicially. History records that on more than one occasion the Nile at Cairo was so low that it could be forded in the early summer, which was doubtless due to such a chain of causes as that above described, assisted by such a distribution of

sandbanks at Cairo as allowed the water to spread over a wide bed without forming a definite channel; for series of low floods due to weakness of the Abyssinian rains are common, but a diminution of the water of the river to such an extent has rarely been recorded.

It will be seen that, with such a reduction of the water-supply in the first half of the year, continuous cultivation of the arable land was impossible until engineering works had been constructed to raise the level of the water sufficiently for it to flow into the perennial supply canals, and until reservoirs existed in which the surplus water of the autumn could be stored for later use. Previously the flood water was led on to the flood plains by canals, so that it might there deposit the silt which it carried in suspension and soak the soil in preparation for the crop which was to follow; on this newly deposited silt and the water-soaked land the seed was sown after the flood water had drained off. Land in Egypt which was not watered by the flood could not be cultivated for that year unless it was situated on the bank of the river, or wells were sunk so that the crops could be watered artificially. Hence the flood was all-important; and one that did not reach the requisite level caused scarcity, want, or even famine. Modern skill has greatly changed these natural conditions until the whole of the delta, and a large part of the valley north of Assiut, receive water throughout the year with the aid of the regulating dams at Assiut, near Cairo, and at Zifta, which enable the water to be turned into high-level canals; the Aswan reservoir furnishes a supply at the season when the normal volume of the river is insufficient for the demands made upon it. Finally, the regulating dam which is now being constructed at Esna, in Upper Egypt, will render it possible to turn the flood waters on to the higher lands in the province of Qena which are not watered by a low flood.

Man has thus so altered the conditions of the Nile supply that in future the flood will no longer have the same pre-eminent importance that it has hitherto enjoyed. In full flood there is always more water than can be utilized, and now the Esna work will enable the high land to be flooded even in years of deficient supply. It is the low-stage supply on which the cotton crop depends that is now most anxiously studied. If the flood has been large, the springs in Abyssinia provide more water to the Sobat and Blue Nile, and these two variable factors in the low-stage supply supplement the volume of the White Nile; if the rains have been weak or have ceased earlier than usual, the springs will diminish early, and the Sobat and Blue Nile give but little help in the early months of the year. It is under these conditions, when the flood of the previous summer has been deficient and the low-stage levels are abnormally low, that the rainstorms, which occasionally break on the Abyssinian plateau from November to March, are of inestimable value. Their importance has hardly been generally recognized as yet, but the investigation of the

meteorological conditions on which these storms depend is being actively prosecuted, and observations from the Nile basin and the surrounding countries are being studied. The winter of 1906-7 furnishes an instance of the importance of these winter rains, for after a flood which was 30 per cent. below the average, rain in February and March raised the river-level sufficiently to convert what would otherwise have been a very deficient summer supply into one which was sufficient for all needs.

Having indicated the geographical phenomena which characterize the Nile Basin as a whole, the peculiarities of certain portions of the river system may be examined.

On the equatorial plateau, where rain falls during the greater part of the year, vegetation grows everywhere luxuriantly, and man can, with little exertion, cultivate as much as is necessary for subsistence; streams flow in every valley, and habitations are not necessarily restricted to certain areas. Under such conditions of a moderately high temperature and plentiful precipitation, the river system does not influence the distribution of animal and vegetable life, nor the habits of the inhabitants, to the same extent that it does in more arid regions.

On leaving the plateau, however, and following the Nile northwards, we soon leave behind us the protracted rainy season, and on the plains which stretch away from the foothills rain falls from May to September, while the winter half of the year is almost dry. The annual amount of precipitation, which near the foothills reaches 50 inches, decreases rapidly as we go northwards, and at the mouth of the Sobat (lat. 9° 30' N.) does not exceed 30 inches, and we find that near the Bahr el Jebel the three conditions of a warm climate, an almost level country, and a moderate rainfall, followed by a dry season lasting for six months, have caused the peculiar character of this portion of the basin. A ridge of granite and gneiss of no great height extends in a north-westerly direction from about Wadelai, and down its northern slope flow the streams which empty themselves into marshes occupying much of the low ground; to the eastward the plains have a greater extent, and reach from the latitude of Gondokoro to the Sobat river, broken only here and there by a knoll of granite. In the rainy season these plains are flooded for miles, and the water is slowly drained off by the meandering channels which, half choked with rank vegetation, afford an inadequate escape for the water, of which a large proportion is removed by evaporation. The Bahr el Jebel, which receives a constant supply from Lake Albert, maintains an open channel and a steady flow throughout the year; many of the others, which are bank-full in the summer months, soon fall as the rain diminishes, and by the winter consist for the most part of almost stagnant pools. Between these streams the country, which is largely flooded in the rains, can only be crossed with difficulty in the dry season on account of the lack of water.

The marshes of the Bahr el Jebel and the Bahr el Ghazal, though

very extensive, are not so vast as they were formerly represented to be, and those of the Bahr el Jebel in particular have been much reduced by the results of recent surveys. This river flows in a very shallow valley from 5 to 15 miles wide, in which at flood time the water in the lower reaches is on a level with the surface of the flood-plain, and even in the upper reaches is but little below it. The abrupt change from the steeply sloping bed above Gondokoro to the level plain below it causes most of the suspended matter to be deposited in the upper reaches, and little if any sedimentation is yet taking place in the middle and lower reaches. Consequently the sides of the flood-plains are still occupied by large lagoons, which are filled in the rainy season and slowly evaporate during the other half of the year; former bends and branches of the river, which changes of the main channel have left as isolated depressions, stand full of water and furnish suitable places for the growth of papyrus and other marsh vegetation. Five hundred miles of such a marsh-grown valley can not only take the rainfall of 30 to 35 inches which falls on it, but can receive also all the water that flows out of the main stream by numerous branches and side channels; much is taken up by the dense growth of marsh plants, and the dry winds which blow from November to April off the dry plains of the Sudan rapidly carry off a vast quantity of moisture; thus it is that the trebling of the volume discharged at Gondokoro in the rainy season has no effect on the volume which leaves the river to join the White Nile at Lake No. The descriptions of the vast marshes, the rank vegetation which blocks the river-bed, the difficulty of recognizing the true river channel, have given rise to an impression that the Bahr el Jebel has no defined bed, but is a shallow stream losing itself in the lagoons. But this is far from being the general case, for all the rivers of these plains excavate for themselves well-defined, steep-sided channels in which they flow. The difficulty of recognizing them is due to the fact that they flow almost at the same level as their flood-plains, and, being free from suspended matter, are not building them up. Conditions are therefore favourable to the growth of marsh vegetation, which extends wherever the water reaches, and which is often able to choke the smaller channels by its growth.

In such country the inhabitants are naturally hunters and fishers or cattle-owners, only a very small amount of ground near the villages being cultivated. During the rains they move with their cattle away from the rivers and marshes, to higher ground between the drainage lines, and later when the wells and ponds there dry up they return to the rivers and the larger lagoons.

In the lower reaches of the Bahr el Ghazal and the Bahr el Jebel the flood-plains lie lower, and the marshes are inundated for a considerable part of the year, from June to December; but this is due, not so much to the local rains as to the flood in the Sobat river. The country is here

so flat that the rise of water-level of 7 or 8 feet in the Sobat at flood stage raises the water-level up-stream for many miles in the river and the lagoons; this facilitates the detachment by storms of wind of the plants growing in the marshes from the bottom. When once set free, these masses of vegetation drift into the main river channel, where they may be arrested at a narrow part or at a sharp bend. More masses are constantly arriving, and soon the block extends across the channel, and in time may completely close it. These sadd-blocks have occurred principally in the last hundred miles of the Bahr el Jebel, a few only having been formed near Ghaba Shambe, where the wide marshes in which the Bahr el Zaraf takes its rise cause a rise of the river-level of the Bahr el Jebel in the rainy season, and so facilitate the setting free of the grass, reeds, and water-plants which may then form the sadd-block. A rise of water-level in the lagoons is therefore an important cause of sadd-blocks, while stormy weather and a narrow meandering river furnish the rest of the necessary conditions.

In the Bahr el Ghazal marsh region the rivers are for the most part shallower, and the vegetation which blocks them is oftener growing on the bed of the stream than drifted into it as loose material derived from the lagoons. But for all this region from Meshra el Rek to the mouth of the Sobat, there is no doubt that the flood in the latter river is the important geographical factor. Although the rains cease on the Abyssinian plateau after September, the level of the Sobat in its lower reaches slowly rises until the end of November, and only begins to fall towards the end of December. This is due to the water which floods the plains to the south of the Sobat through which the Pibor river flows. Miles of country are flooded to a depth of about 2 feet, and are slowly drained off into the Sobat as the supply from the plateau diminishes, so that the level in the main river is maintained. The effect of the Sobat flood is felt even as far as Meshra el Rek on the Bahr el Ghazal, for here too the variation of the water-level follows that of the Sobat exactly in rising very slowly from June, in attaining its maximum level at the beginning of December, and in falling rapidly at the end of that month. The effect of this regimen on the discharge at Taufikia is shown in Fig. 1.

The Sobat, which rises on the southern portion of the Abyssinian plateau at an altitude of some 7000 feet, descends very rapidly to the low-lying Sudan plains, through which it flows in a well-defined channel. The slope here being low, most of the suspended material is deposited in the middle reaches, to form sandbanks which render navigation difficult at the low stage. It is characterized by the late maximum level which has been already alluded to, and which notably augments the volume of water available for Egypt in January and February. In April and May its supply is small, but in favourable years it is a valuable addition to the White Nile.

Although the country of the Bahr el Jebel and the lower Sobat is a vast plain having a very slight inclination, the flattest portion of the Nile valley is that between the mouth of the Sobat and Khartum. Here, the river falls, at low stage, only 26 feet in a distance of 515 miles, or 1 in 107,000, equivalent to little more than half an inch a mile; at high stage, when the Blue Nile has risen 26 feet, the water of the White Nile is held up so that the water-slope from Taufikia to Khartum is only 11 feet in the same distance, or 1 in 255,000, which corresponds to about a quarter of an inch per mile only; but this slope occurs in the southern portion only, for from Renk to Khartum, a distance of about 300 miles, the river presents a level surface, and this portion of the valley is a vast reservoir held up by the flood-water of the Blue Nile.

The river here flows through a vast plain, with the low hills of Kordofan on the west, and those of the centre of the Gezira on the east, which divide it from the basin of the Blue Nile. Both these hill masses consist of granites, gneisses, and other crystalline rocks, representing the worn-down stump of a hill range which in former times was of much greater importance; long-continued erosion has worn them away, and streams have distributed the material to form the alluvial plains of the White Nile. On these numberless herds of cattle and sheep are raised by the tribes which inhabit them, and in some parts considerable crops are raised in the rainy season; but the rainfall rapidly diminishes as we move northwards, and at Khartum it only amounts to about 4 or 5 inches annually, which falls in the four months June to September, the remainder of the year being hot and dry. We have now left the thorn forest and the savannah type of country in which the gum acacia predominates, for north of lat. 16° even these become rare, and we enter the rainless desert of Northern Africa.

At Khartum very different conditions are encountered; not only does the rainless region begin immediately north of it, but the heavy rainfall of Abyssinia furnishes the flood of the Blue Nile which both waters the lower reaches of the river and carries down to them the red-brown silt which forms the flood-plains of Egypt. The great volume of the Blue Nile flood, as compared with that of the White Nile, has already been alluded to, as well as its occurrence during a short season of four months in the summer.\* After leaving the hills of Abyssinia, the Blue Nile flows in the channel which it has eroded in the alluvial deposits which overlie the crystalline rocks of the region, and the banks are of sufficient height to prevent the flooding of the lands which border it. The slope of the river at low stage is about 1 in 3000 between Fazogli and Roseires, but decreases to 1 in 8000 below the latter place.

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\* Cf. *Geographical Journal*, September, 1906; and 'Physiography of the Nile Basin,' chap. vi. Cairo: 1906.

It is highly probable that on the whole the river is slowly eroding its bed as the cataracts below Berber are being worn away, but the change of slope between Singa and Sennar is very remarkable. Here the slope is only 1 in 10,900, while up-stream of this reach it is 1 in 8300 and below it 1 in 9100. Since, so far as is known, there is no ridge of hard rock at this point to account for the change of slope, a gradual warping of this part of the country may be the cause, and the extreme meandering of the parallel streams, the Rahad and the Dinder, in the same region gives some support to the hypothesis.

Below Khartum the river enters the region of the cataracts, which are generally described as being six in number; but this is not strictly accurate, for one portion, which is but a deep and narrow gorge, is included as the sixth cataract, while, on the other hand, the important series of rapids which occur immediately down-stream of Abu Hamed are ignored. At no point is there any considerable vertical fall, but each so-called cataract consists of one or more series of rapids, in which the water-slope is from about 1 in 2000 to 1 in 800. In every case the rock channel is formed of granite, gneiss, or crystalline schists, which have usually been greatly crushed by earth-movements, in consequence of which lines of weakness have been developed, thus determining the direction of the various water-channels, which often follow the line of intrusive dykes.

As the river has cut its way down through the overlying sandstone of Cretaceous age, it has met with portions of the uneven floor of crystalline rocks on which the sandstone was originally deposited, and the position of these rocky ridges have determined the position of the cataracts; but the directions and positions of the water-channels, and of the different rapids, are due to the structure of the rock masses themselves as they now exist, after the crushing and dislocation to which they have been subjected during the past history of the continent.

Up-stream of each of these outcrops of harder rock, which form a series of steps down which the Nile flows, there is a reach of low slope, in which the river flows placidly through the sandstone region in the narrow alluvial plain which it has deposited during past centuries. These barriers of hard rock seemed to promise suitable sites on which masonry dams might be erected, for the purpose of storing the additional water which was needed for the irrigation of the cultivable lands in Egypt; but a survey of the whole length of the river from Khartum to Wadi Halfa, and the detailed examination of the three reaches which offered most prospect of storing the necessary quantity of water, showed that nowhere was there a site offering the advantages of that at the Aswan cataract, while in more than one of the sites examined the rocks had been so crushed and fissured as to afford but an unsafe foundation for large works.

Fifty miles below Khartum, the Nile, which has been flowing through

a sandstone plain, enters the Shabluka gorge, which is  $7\frac{1}{2}$  miles long, and cuts directly through the hill mass of this name. This is commonly called the sixth cataract, but the total fall of the water-level at low stage is only 28 inches in this length, and it is the rush of the whole river through a deep and narrow channel which causes the troubled water and suggests a steep slope: the depth is very great, being as much as 100 feet at one point in the middle of the gorge in January, and 80 feet at another point near the down-stream end. It is very remarkable that the river should have taken its course through this isolated hill-mass of crystalline rocks instead of excavating a channel through the softer gneisses which now form the low ground around. This point demands detailed investigation, but there is evidence that the gorge existed in some form at a very remote period; that it was filled with sandstone in Cretaceous times, and that in the modern erosion of the country the river has reoccupied the ancient gorge by excavating the sandstone which filled it; further examination, however, is needed before this question can be considered as finally settled.

The next cataract, the fifth, begins about 30 miles below Berber, and consists of three or four separate groups of rapids. Together with the intervening reaches of low slope, they occupy nearly 100 miles of valley in which the river descends 82 feet; beyond this a reach of low slope for 30 miles extends to Abu Hamed. This reach up-stream of Abu Hamed seemed at first to offer many advantages for a reservoir, but a detailed survey showed that the valley opened out widely at the northern end until any economical storage of water in it became impracticable.

Here the Nile makes its great bend to the westward, flowing at times even southwards; but the causes which determined this in the past have yet to be found, and careful examination of this portion of the basin is needed to lead to a solution of the problem. From Abu Hamed to Merowe, a distance of 150 miles, the river flows principally over crystalline rocks, and rapids occurs frequently at short intervals. In the first 17 miles the river falls 60 feet, and afterwards follows an irregular course through these rocks for another 125 miles before reaching the head of the fourth cataract at Shirri island, 10 miles below which is Merowe. Shirri island was specially examined as possibly providing a site for a dam, but the valley between this point and the cataract at Abu Hamed was not large enough to contain the necessary volume of water (see Fig. 2).

A long reach then follows, in which, for 160 miles, sandstone rock alone occurs on either side of the alluvial plain, and it is not until Abu Fatma, 40 miles north of Dongola, that the third cataract commences.

From this point to Wadi Halfa the rapids which are collectively grouped as the third and second cataracts, occupy a great part of the river's course. In general character they have much in common with

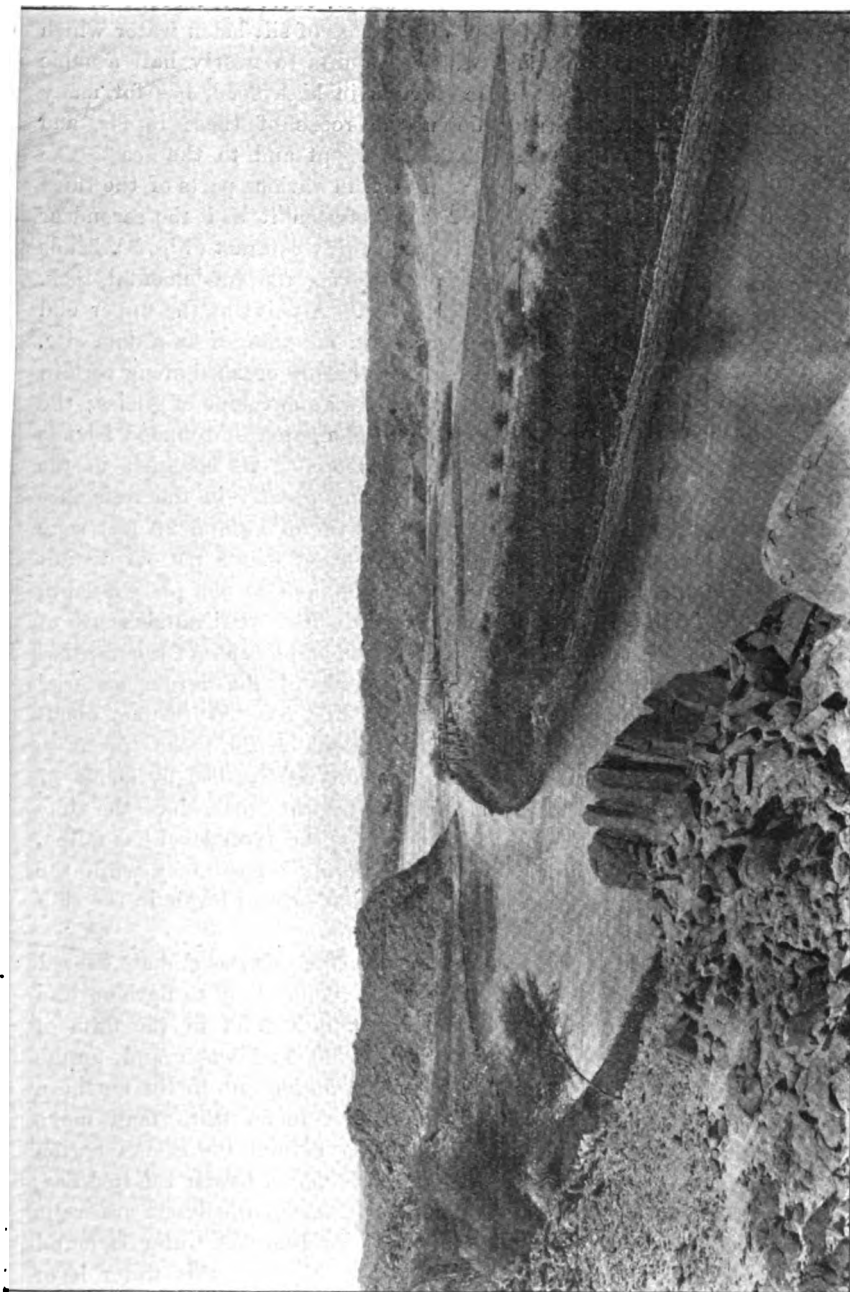


FIG. 2.—DUMAG ISLAND, UPPER END OF FOURTH CATARACT.

(Photo by E. M. Dawson.)

each other and with those which have been already mentioned, but each has peculiarities of its own, which, however, exceed the scope of the present paper. The erosive action of the mass of silt-laden water which pours down them in flood, and which amounts to nearly half a cubic mile of water per diem when the river is in high flood, has for many thousand years been wearing down the rocks of these rapids, and carrying the material to the delta of Egypt and to the sea. The character of these rapids may be well seen in various parts of the third cataract, and among those which occur between it and the second or Wadi Halfa cataract. At Hannek, in the third cataract (Fig. 3), bands of granite traversing the gneiss, which forms the fundamental rock, give rise to obstructions to the river's flow. A point at the upper end of the Dal cataract seemed to offer certain advantages as a dam site. Here the rock is a granite, which has been highly crushed along certain lines, leaving uncrushed masses as kernels in an envelope of gneiss; the result has been to form a number of small elongated or rounded islands of granite, between which the water has eroded its channels in the softer gneiss (see Fig. 4). These rocks vary greatly in the resistance which they offer to erosion, and while depths of 15 and 20 feet were found at low stage in certain channels, at other points not far distant depths of 60 and 70 feet were not uncommon, and at one place a depth of as much as 130 feet was recorded. Again, at the Atiri rapids south of Semna, an intermixture of granite and schists is the cause of the unequal erosion which has left the rocks and islands of the harder material to obstruct the fairway of the river (see Fig. 5). At Semna, about 12 miles above the second cataract, inscriptions on the rocks appear to show that since 2000 B.C. the river has lowered its bed by about 27 feet, and recent excavations in Nubia also indicate that, since the time when pre-dynastic man inhabited the valley, the river-level has fallen, doubtless in consequence of the erosion of the Aswan cataract, while the existence of terraces of water-rolled detritus at several levels in the side valleys furnishes confirmatory evidence of this.

Throughout this region a narrow valley in a rainless climate offered little opportunity or encouragement for a population to develop and thrive. In the southern portion sufficient rain falls in the form of summer storms to enable the nomad Arab to find water and forage in the valleys sufficient for himself and his flocks, but in the northern part the country is too inhospitable for him to do more than move through it between the fertile valley of Egypt and the Sudan region of the monsoon rains, except among the hills which border the Red Sea, where water is more plentiful. Here and there in the desert are wells and in the El Kab depression, to the west of Dongola, water is found at a short distance from the surface. The origin of this water is of much interest; but as yet verified facts are so few that we are left to choose between several more or less probable hypotheses. It is, however,

certain, from such measurements as have been made, that there is a considerable loss of water between Khartum and Wadi Halfa in flood, which is greater than can be accounted for by evaporation. Much of this water makes its way into the alluvial flood-plain, and it seems more than probable that it also percolates into the porous Nubian sandstone. In the rainless Nubian climate the underground water-table must slope away from the river, and this water must find its way into the lower layers. In default of any accurate levels or borings in the desert, no more can be said at present, but the observations on discharge made at the Aswan dam should, when published, show what loss takes place in this manner in the Wadi Halfa-Aswan reach. It has, moreover, been shown that when the river-level falls below that of the water-table in the flood-plain, water drains back into the river at low stage, and Mr. Craig \* has shown that this may amount to as much as 3500 cubic feet per second between Khartum and Wadi Halfa at the lowest stage of the river. As the whole discharge is not more than six or seven times this amount at this season, it is not an unimportant factor.

The remaining portion of the Nile basin, consisting of the valley below the Aswan cataract and the Delta, differs very markedly from the regions which have been referred to. A valley of rich alluvial soil, some 5 to 10 miles wide and 600 miles long, and a delta of the same character, now supports an agricultural population of exceptional density, which numbers on the average about 1100 persons to the square mile. This tract of country possesses very marked characteristics, which have undoubtedly affected in a high degree the customs, the habits, and the character of its inhabitants. As a watered valley in the midst of an absolutely arid region, it must have been occupied in very early times, and when the remains of palæolithic man in the valleys and on the desert margins have been more fully collected and studied, it should be possible to glean important information concerning his occupation of this part of the world. At that early time the valley was probably occupied for the most part by jungle and marsh, conditions approximating somewhat to those of the Bahr el Jebel of to-day, and early man may have lived on the desert margin, fished in the river, its lagoons, and backwaters, and hunted and trapped animals in the jungle which bordered them, much as the Dinka negro does to-day. The earliest representations that we possess of the ancient inhabitants show, in their crowns, their ornaments, their ceremonial dress, and so forth, evident traces of their former occupations of hunting and fishing before they became an agricultural people. As the deposit of silt by the waters of the annual inundation continued, the banks of the river would be gradually built up, the flood-plains would extend at the expense of

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\* 'The Nile Flood and Rains of the Nile Basin, 1906.' Survey Dept., Cairo. 1907.

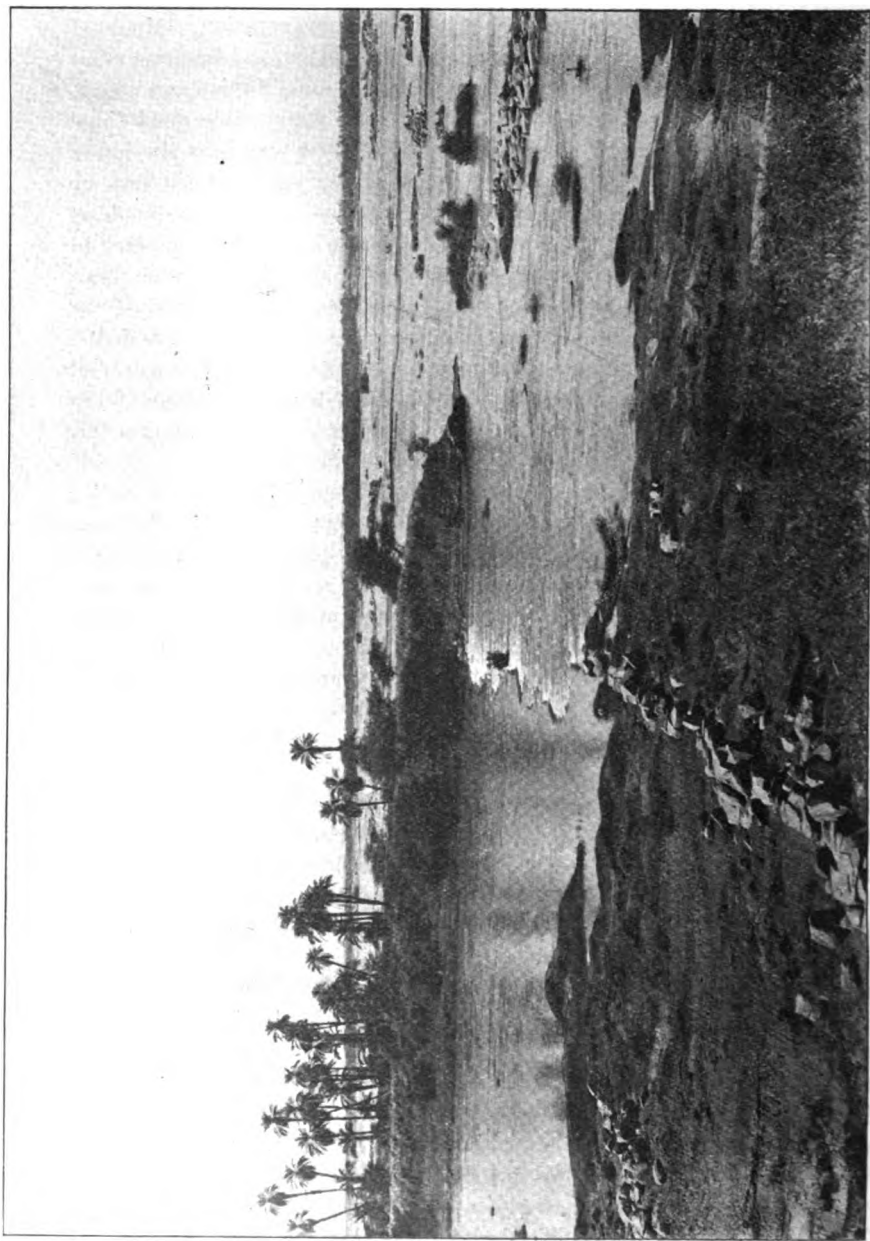


FIG. 8.—A PORTION OF HANNEK CATARACT.  
(Photo by E. M. Dawson.)

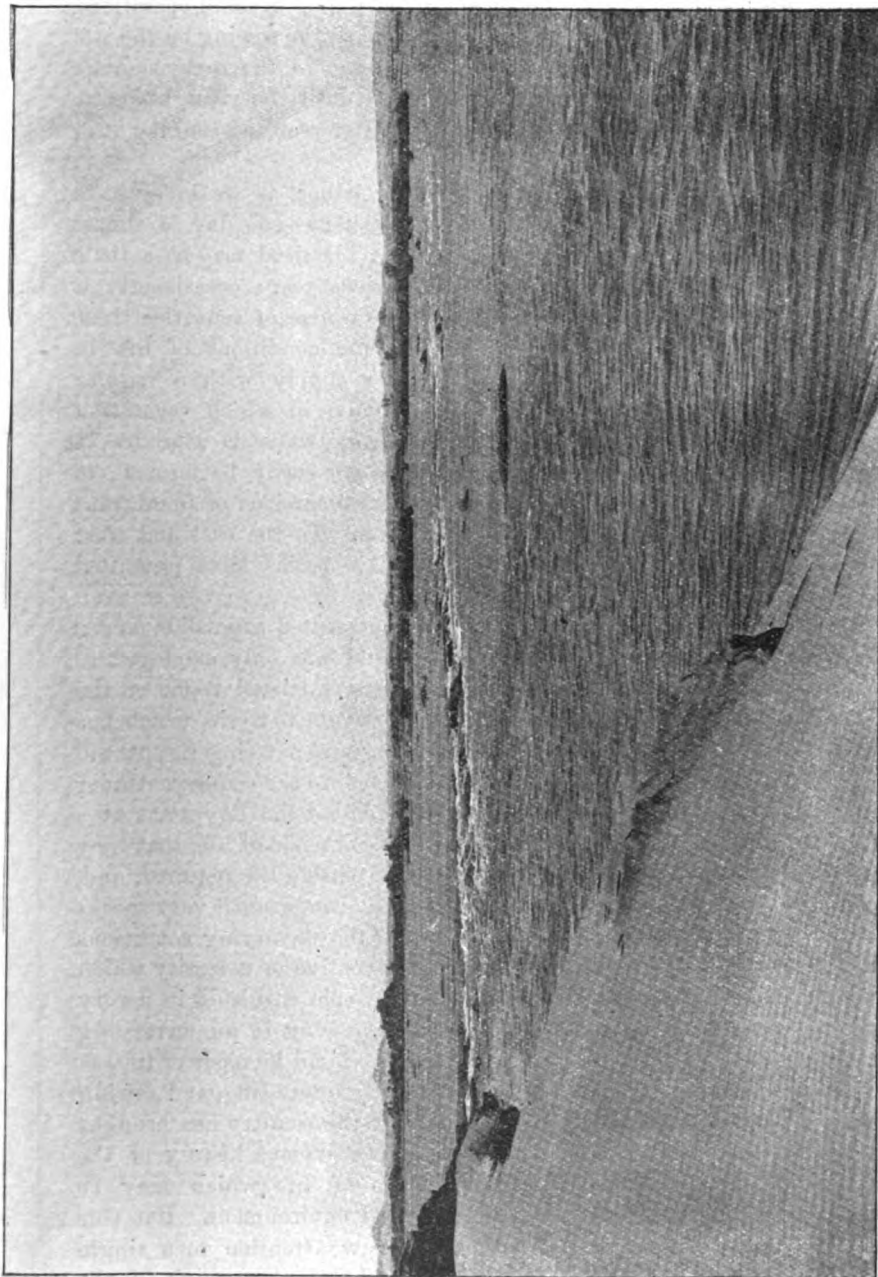


FIG 4.—A PORTION OF DAL CATARACT.

(Photo by E. M. Dawson.)

the lagoons, and land within reach of water would become available for agriculture; and from that time onwards the yearly cycle of operations, the inundation of the land by the annual flood, the sowing on the wet mud as soon as the water drained off, the harvest in the early summer months, and the period of waiting from then until the river began to fall after the next flood, repeated itself year after year and century after century without appreciable variation.

In the rainless climate of this region, weather, as we know it in Northern Europe, may be said to be non-existent—one day is almost exactly like the next and the one before it. The flood may be a little higher or a little lower than in the previous year; occasionally it may fail or be dangerously high, but in the course of centuries these slight variations are of small effect, and the conditions of life in Egypt are exceptionally constant: a water supply with a regular seasonal variation, no rainfall, a warm climate in which vegetation can grow throughout the year if the necessary water is available, a rich alluvial plain on which water-channels can easily be formed; to these are to be added exceptional freedom from incursions of immigrant races of greater power, or higher organization. To the east and west lie the deserts which throughout the historic period have presented a barrier which could be passed with difficulty by one or two caravan routes. To the south the Nile valley itself presented a possible means of ingress, but one which could be closed, and was only employed to a moderate extent. The marshes of the Delta restricted traffic on the north, and even the road along its eastern margin to Syria, which has been trodden by numerous armies both leaving and entering Egypt, did not offer exceptional facilities for a ready entry into the country. Under these circumstances it is not surprising to find that the Egyptians at a very early period settled down to an agricultural mode of life, that they early perfected the ordinary operations which such a life required, and, having done so, preserved them with but little change until very recent times. Simple methods were well suited to the unvarying conditions among which they lived, and there was no incentive or necessity which might compel them to modify them. This people furnishes in a very marked degree an example of an organism growing in an unvarying environment to which it had early adapted itself and its mode of life.

To the geographer such a case is especially interesting, and during recent years the archaeological exploration of the country has brought to light a store of information concerning the ancient history of the Egyptians, their customs, and their mode of life which may be profitably studied in relation to their physical environment. But this is a very wide subject, and I will only draw attention to a single aspect of it which is directly connected with my own work in the country—the measurement of the land. The annual flood, rising in July within a few days of the same date year after year, and falling

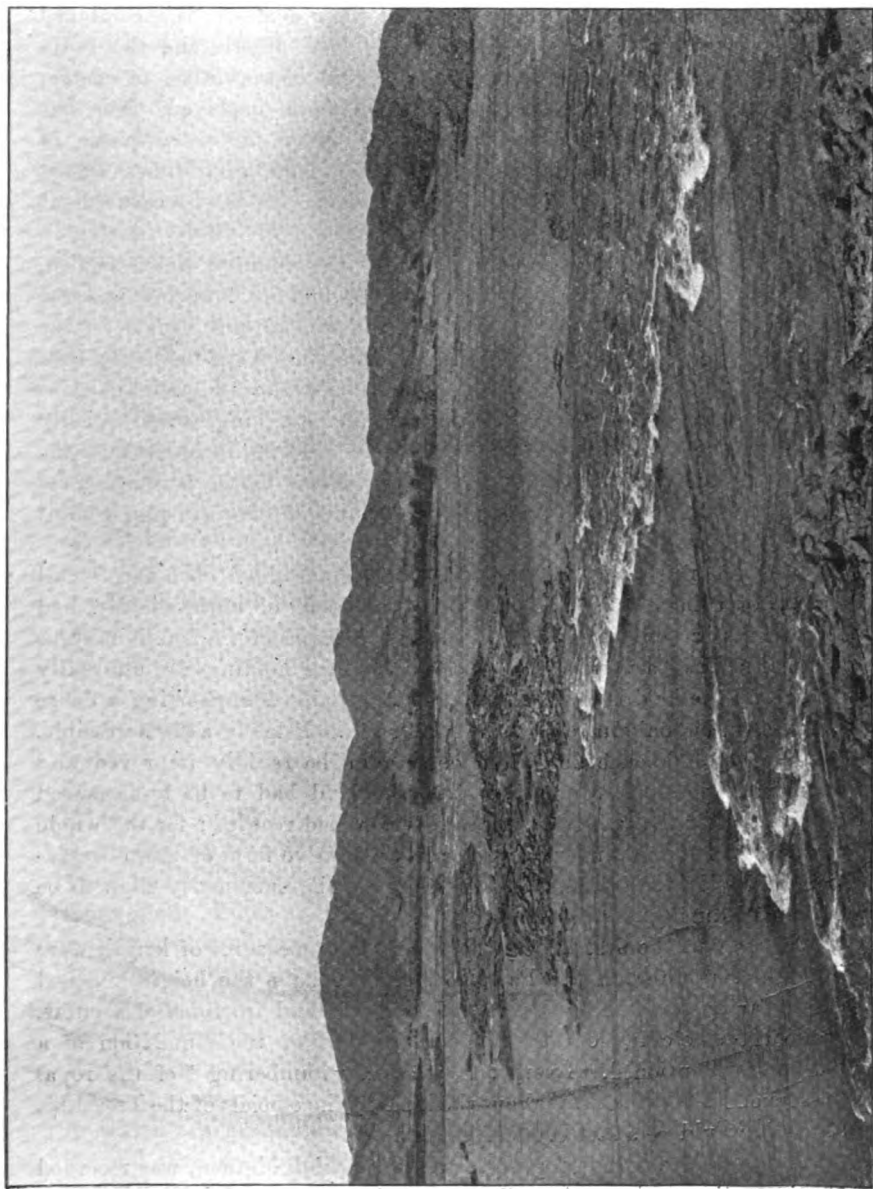


FIG. 5.—THE ATIRI RAPIDS.

(Photo by E. M. Dawson.)

in October with equal regularity, has, from the earliest times, caused an invariability in the field-seasons which must have reacted on the character of the people. This unvarying cycle of their water-supply, of their agriculture, and consequently of their domestic life, combined with the freedom from immigration which the deserts and the Delta swamps ensured, laid the foundations of that conservatism of custom and character which the Egyptian has always displayed. Nor has this greatly changed, and there exist to-day in every phase of Egyptian life traits which have come down from early times almost unaltered; the examples furnished by the science of land-measurement are as striking as any that we know.

As soon as any considerable tract of the country was occupied, attempts would be made to control the river and its branches, and the natural spills and backwaters would be improved to form canals for the purpose of leading the flood-waters wherever they were required; thus the water would be supplied along certain lines to the land under cultivation, and this, as well as the convenience in ploughing, would quickly lead to the development of the long narrow holding, in order that the owners of small areas should have direct access to the water-channel which served them; the definition of the unit of area as being 1 cubit by 100 cubits shows this.

The geographical factors of the valley determined once and for all a state of things which the surveyor, consciously or unconsciously, had to take into account if his work was to be satisfactory, and it may be summarized as—a narrow belt of country where holdings are unusually small and the land is of high value, being capable of supporting a dense population, but only in so far as the water of the Nile is readily accessible.

The method, once decided upon, would be rapidly improved and developed by constant practice, since the land had to be re-measured annually after the waters of the inundation had receded; for the whole country was at first under a more or less primitive form of basin irrigation, and only the banks of the river would be sufficiently high to be cultivated during the flood season.

As early as the first dynasty (3400 B.C.) the measures of length were in regular use, for on the Palermo stone we have the height reached each year by the Nile flood recorded in cubits and fractions of a cubit, while the stretching of the (measuring) cord at the foundation of a temple is mentioned. Every two years a "numbering" of the royal possessions was made throughout the land by the officials of the Treasury, and this would be a sort of verifying survey.

About 3000 B.C. the property of a high official, Methen, was recorded on the walls of his tomb at Saqqara as having been duly registered to him in the royal archives or registry.

Another of the tombs at Saqqara, that of a certain Mes, furnishes us with information of exceptional interest. Certain lands near Memphis,

which the Pharaoh Amosis (1580 B.C.) had conferred on an ancestor of Mes named Neshi, were, during the minority of Mes, claimed by a certain Khay as his property. A lawsuit followed, in which Khay produced false title deeds, whereupon Nubnofret, the mother of Mes, appealed to the official registers, saying, "Let there be brought to me the registers from the treasury and likewise from the department of the granary of Pharaoh."

In later times, about 900 or 850 B.C., the register of the lands and springs in the oasis of Dakhla is referred to in an inscription which tells of a lawsuit concerning the ownership of a spring; nineteen years elapsed before a decision was obtained. Thus the owner's name, the area of the property, its position, and the tax due from it were regularly recorded, and, in the New Empire at least, duplicate registers were kept in the treasury and the royal granary. Boundaries were described as north, south, east, and west, without being any more exactly defined, just as in the Egyptian title-deeds of to-day, and the Nile, the desert, or the land of such and such a landowner were recorded as being situated on the confines of the plot referred to. A monarch of Assiut, about 2300 B.C., says that he irrigated by a new canal the high land which otherwise could not be cultivated. The vizier Rekhmara, in his tomb at Thebes, records how cases of disputed ownership in land were to be dealt with, and all approved titles registered, but unregistered claims were ignored.

At El Kab, in the tomb of Sebek-nekt, land is divided into low-lying, of which there were twenty "thousands," and land on the high ground (one hundred and twenty "thousands"): the unit which the sign for "thousand" represents is ten *arouræ*, or about 6·3 acres.

At every period, therefore, of ancient Egyptian history, the land was measured and recorded with considerable accuracy; property was dealt in regularly, and an elaborate system of registration was maintained. No map of landed property in ancient Egypt has come down to us, but on the tomb-walls we meet with representations of land-measurers at work. Their methods of land-measurement are represented on the walls of the tomb of one Menna at Sheikh Abd el Qurna, in Thebes, a land overseer and inspector of the boundary-stones of Amon. The scene depicted shows two chainmen measuring a field of corn with a long cord, on which are knots or marks at intervals which seem to be about 4 or 5 cubits in length; each also carries a spare cord coiled up on his arm. Beside them walk three officials, who carry writing materials, and who are accompanied by a small boy carrying writing materials and a bag in which are probably documents and plans referring to the property. An old man and two boys also accompany the surveyors, and a peasant brings a loaf of bread and a bunch of green corn.

A similar scene is pictured on the walls of a tomb belonging to a certain Amenhotep, also at Sheikh Abd el Qurna. Here only one man accompanies the chainmen, each of whom, as usual, carries a spare cord.

The figures are larger than in the tomb of Menna, and though they are now much damaged, it is possible to see clearly that the cord terminated in a ram's head.

The statue of the priest Pa-en-anhor from Abydos, and now in the Cairo Museum (Cat. No. 4875), shows him in a kneeling position and holding a rolled-up measuring-cord, at the end of which is a ram's head.

Of their topographical maps two alone have come down to us drawn on papyrus. One of these, which is only partially preserved, represents the mining district east of Quft, and dates from the time of Ramses II., the other is probably a plan of one of the mining centres lying further to the south. Two valleys run parallel to each other between the mountains, one of them being covered with blocks of stone and bushes, while a winding valley unites them. One valley and a narrow pass are said to lead to the sea; the name of the place which is reached by following the other valley is not decipherable. Other features in the map are the mountains in which gold is found, and others where it is worked; a sanctuary of Amon, as well as miners' houses and a water-tank or well, round which is shown a patch of cultivation, are indicated.

Of accurate measurements on the ground we have numerous examples in the pyramids, temples, and rock-tombs; the pyramids of Giza furnish perhaps the best known and most fully studied instances.

Not only were the Egyptians of these remote times competent to measure lands and lay out large buildings, but they had attained a very satisfactory accuracy in levelling, and of this the pyramids of Giza again furnish proof. Borchardt, in his paper on "Nilmesser und Nilstandsmarken," \* adduces many facts in support of the view that they carried out a line of levelling from the head of the Delta to the first cataract in connection with the nilometers which were built at every important town; and this, too, was done with a very fair accuracy, since the average slope from the scales on these nilometers works out at 1 in 14,440 against 1 in 13,700, as given to-day by the levels of the Irrigation Service. The instrument used was a right-angled isosceles triangle of wood, with a plumb-line attached to the apex; it was doubtless used on a long wooden straight-edge, which, in its turn, rested on pickets. In this way levelling of a very fair accuracy could be rapidly executed.

The principal unit of length from the earliest times was the cubit of 20·6 inches, containing 7 palms or 28 fingers, which was called the royal cubit, distinguishing it from the short cubit of 6 palms.

For land, a measure of 100 royal cubits, named *khet* or *khet-n-nuh*, "a reel of cord," formed the unit, while the usual itinerary measure was the *ater* or *schoenus*.

The areas of the fields were reckoned in squares of the *khet*, or 100

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\* *Abhandlungen d. königl. preuss. Akademie.* Berlin. 1906.

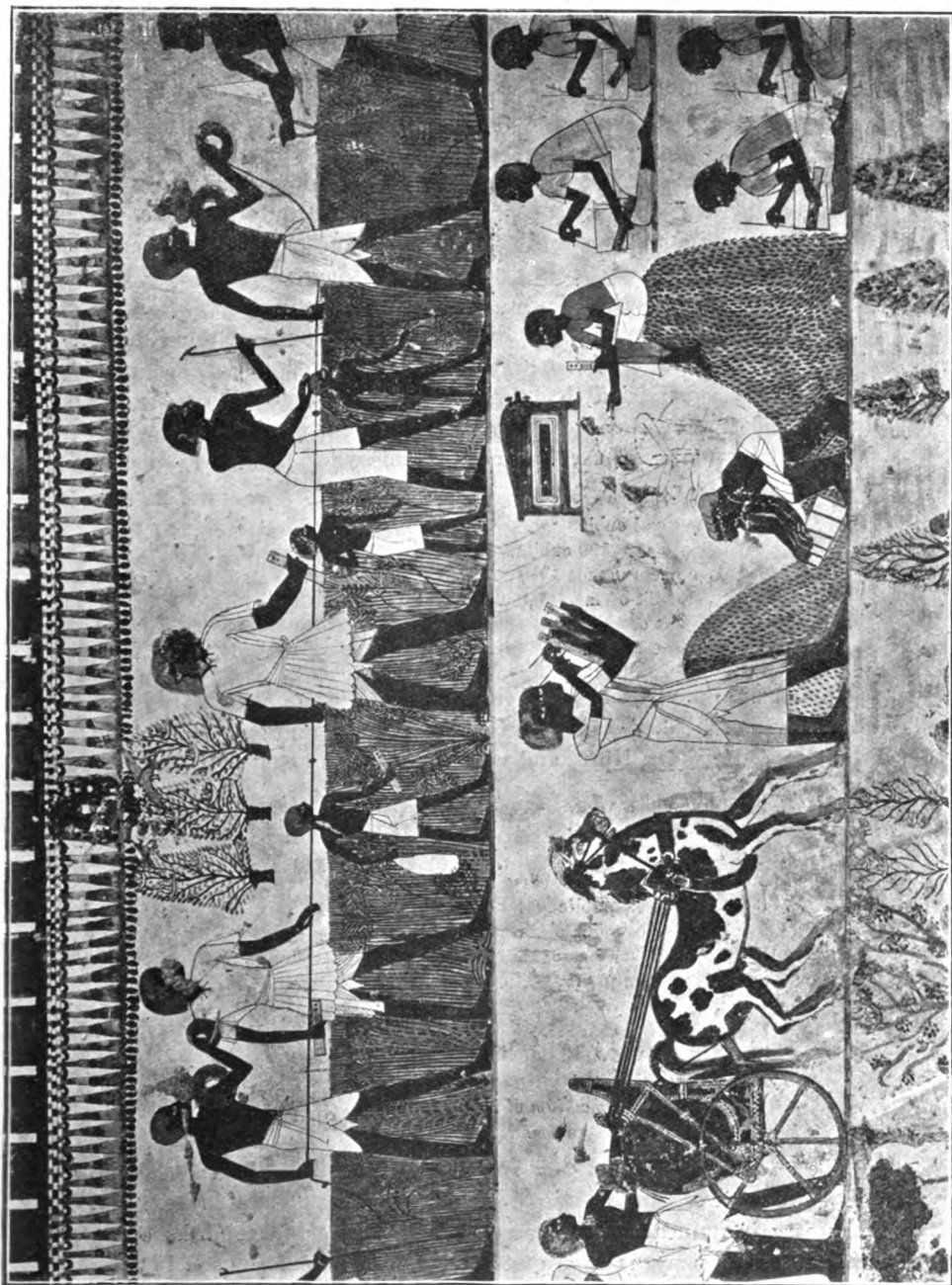


FIG. 6.—EGYPTIAN LAND MEASURERS, THEBES.

(Photo by Dr. Borchardt.)

royal cubits, such a square being called in Egyptian *set*, and in Greek *aroura*. It was considered as being composed of 100 strips, each 100 cubits long by 1 cubit in breadth. The divisions of the *set* or *aroura* were the half, the quarter, and the eighth, after which the cubit became the unit; but in late Ptolemaic times the subdivisions were continued to the thirty-second, and the Greeks carried them further to the sixty-fourth part. A half *aroura* was also in use in late Egyptian times, and this exemplifies the approximate methods used in computation, for it was called *remen*, or the upper arm. This was a measure of 5 palms, whereas the royal cubit contained 7 palms, so that their squares contained 25 and 49 square palms respectively, or a proportion of nearly one to two. At Aneiba, a village nearly opposite Ibrim in Nubia, there are some tombs in which the extent of certain estates is represented by notched rectangles. Each subdivision thus formed represented, doubtless, a *set* or *aroura*. Small areas, such as a well or tank, were given in square cubits.

Thus, the units in use in ancient times for land-measurement were:—

Length—royal cubit	= 20·6 inches
khet = 100 cubits	= 57·2 yards
Area—square cubit	= 0·305 sq. yds.
cubit of land = 100 sq. cubits	= 30·5     "
set or aroura = 100 cubits of land	= 3050     "
the "thousand" or 10 arouræ	= 6·3 acres

In Roman times, we have several additional units, which are given in a papyrus (No. 669) found at Oxyrhynchus (Bahnessa) in 1903, by Prof. Grenfell and Dr. Hunt, and which dates from about 290 A.D.

2 palms make a	λιχάς.
3     "     "	σπιθαί 4.
4     "     "	ποῦς.
5     "     "	cloth-weaver's cubit.
6     "     "	public and a carpenter's cubit.
7     "     "	nilometer or royal cubit.
10    "     "	βήμα, or the distance of the outstretched feet.
3 cubits make a	public ξύλον.
4     "     "	ὀργυρίδ.
?	καλάμος.
6½	ἄκαινα.
40	ἄμμα.
96	schœnium of land-surveying.
100	schœnium.

The *schœnium*, like the *khet* in earlier times, was the side of the square *aroura* or *set*, and measured 100 royal cubits of 20·6 inches; and the *aroura* contained about 3050 square yards, or five-eighths of an acre. But the papyrus just quoted says that *schœnium* used in land surveying was a square of 96 cubits; one probable reason for the change being the greater convenience in estimating the thirty-second and other fractions of the *aroura*.

But these measurements are not those which are in use to-day. Though the ancient measure of the *aroura* is referred to in papyri as late as the sixth and seventh centuries, in an Arabic papyrus from the Fayum, dated 724 A.D., the *feddan* is used to define areas. It is very remarkable that the older measures, which had been so long in use, should have been within a hundred years, or rather more, completely replaced by one of Syrian origin, which has remained in use ever since.

But little is known of the manner in which land was classified in ancient Egypt, but papyri, of Ptolemaic age, from the Fayum give full details of the system which then existed. There was very little difference between it and the present-day practice. Private land was classed separately from that of the government; canals and canal-banks were shown; land which had deteriorated was transferred from one class to another; in fact, the measurement and registration of land two thousand years ago differed but little from the present practice, except that the methods of computation were approximate instead of being exact, but even this change is limited to the present survey, and has not yet become the universal practice.

In early historic times Egypt was largely agricultural, but a great extent of marsh and lagoon still remained which was flooded annually, and retained water to a greater or less extent throughout the year. As time went on man controlled more and more the flood waters, and extended his cultivation as the marshes were silted up or drained. When the whole of the flood-plain was under cultivation as well as the greater part of the Delta, the annual flood was of paramount importance, and the extent to which its waters could be led determined the maximum area which could be cultivated. Now modern engineering science has supplied water at all seasons of the year to both the valley and the Delta, so that the flood has lost its importance, and the low-stage supply of the river has become the first consideration, so much so that heavy expenditure is incurred to augment it in every possible way; the natural resources of the country have been immensely increased by fully utilizing a climate which favoured the growth of vegetation throughout the year, if water was obtainable.

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The PRESIDENT, before the paper: The subject of to-night's paper is Egypt, the Nile valley, and the land bordering on the Nile. Whilst he has been Director of the Egyptian Survey, Captain Lyons, the author of the paper to-night, has had excellent opportunities for studying the various problems connected with that great river. During that period, a great deal of country has been well mapped; many of the geological problems have been attacked; and the solution of many of the questions connected with the archaeology has been greatly facilitated by his work. He has, therefore, made admirable use of the opportunities offered to him. In listening to Captain Lyons on this question, we are listening to one who speaks with greater authority on questions connected with the hydrography of the Nile than any other man in Europe.

Sir GEORGE DARWIN: I cannot add anything to the very interesting account

of the Nile which Captain Lyons has just given us. In the last part of his address, however, he showed us some pictures of ancient Egyptian instruments for surveying. This shows that the department over which he has presided with such conspicuous success is of great antiquity. The few words which fell from him indicate that he will agree with me in thinking that we are too apt to believe ourselves far superior to our ancestors. No doubt with our mechanical appliances we obtain more accurate results than they did, but they also attained results of great accuracy, although with greater trouble. This survey of the time of the Pharaohs is very ancient, but there must, in the mean time, have been a long interval when the survey practically ceased to exist, and the Egyptians have to thank the present occupiers of Egypt for its re-establishment. Although a cadastral survey does not loom largely in the popular estimation, yet it is a thing on which the prosperity of an agricultural community depends to a very large extent. About three years ago, when I visited Cairo, Captain Lyons showed me his department, and I there had the pleasure of greeting some of my Cambridge friends and pupils who are now working under him. The beautiful maps which I saw there are second, I think, to none, and I was struck with wonder at some of those maps which exhibit the extraordinary subdivision of property, as you have just now seen exhibited on the screen. It may not, perhaps, be obvious to every one how great is the difficulty with which the survey of Egypt has had to deal in making maps of such properties, and I do not think that any other survey has dealt with such a task more successfully. I suppose that the area in which these excessively long and narrow holdings prevail is of considerable size. Now if we imagine that the whole county of Yorkshire were laid out in allotment gardens, and that the peace and prosperity of every holder of an allotment depended upon the accuracy of the Ordnance Survey defining its borders, we should form a picture of the difficulty with which Captain Lyons has dealt so well. He will no doubt correct me if I am wrong, but I believe that the delta of the Nile is a region in which surveying has its peculiar difficulties, for there are no elevations from which angles may be measured, and no conspicuous objects; this makes the task of the surveyor a very arduous one.

Another branch of the survey has a special interest for me who am concerned in geodesy. It is necessary that there should be a backbone of accurate triangulation for the survey of any country. Such a basis would be afforded by a triangulation along the Nile valley of the first class of accuracy. Triangulation is now in progress in Egypt, and I doubt not that, within a few years' time, a triangulation of the first order of accuracy will be carried up the Nile, and away to the south, until it reaches German territory. This will afford the requisite backbone for the accurate mapping of the whole of Africa, at least on its eastern side. It will ultimately meet that great triangulation of which so much has already been carried out in the south. Although I do not think the fact has yet been published, I may tell you that at the present moment the survey along the 30th meridian of east longitude has been carried out from the Cape Colony northward to within 70 miles of German territory. The observations for the most northerly portion are not yet finally reduced, but that will be finished shortly. Within a year or two this triangulation will certainly have been carried up to Lake Tanganyika. There is also little room to doubt that the German Government will soon take up their part of the task and carry the work further northward. Within a generation from now, the main survey from the south will be extended until it reaches the triangulation of which Captain Lyons is laying the foundation.

I feel that I have already detained you too long, and in concluding I should

like to congratulate Captain Lyons not only on his interesting paper to-night, but still more so on his magnificent services to Egypt in the conduct of the survey of that country.

Mr. HOGARTH: I cannot claim to be a first-rate authority on the Nile, least of all geographically. Like Sir George Darwin, I should like to congratulate Captain Lyons. I have not known which to admire most, the clearness with which he explained those difficult diagrams, or the remarkable width of his knowledge. It is of course well known, if he were not Director of the Survey, that he might be Director of the Cairo Museum of Archæology. Perhaps the best thing I can do is to ask Captain Lyons one or two questions which must have occurred to everybody, and to which I hope he will favour us with a reply. They are these. If he is allowed as an official, will he tell us what measures are in prospect at present for dealing with this remarkable and apparently increasing difficulty of getting enough water for Egypt other than by the raising of the Assuan dam. Of course, the difficulty largely arises, as Captain Lyons has shown us, from the changed conditions of agriculture, particularly from the increase of cotton-planting. It is a remarkable fact that in Roman times they were apparently able to get sufficient water, and that the difficulty which has existed now for several generations, the difficulty caused by the existence of great wastes of land in the delta of the Nile, did not exist then. If you travel in certain parts of this delta to-day, you will see that vines and olive trees were cultivated in Roman times; now that country is perfectly incapable of growing either of those plants. This is due partly perhaps to the fact that the delta of the Nile is experiencing periodic or continuous subsidence. But, whether or no, the ancients at a certain period were able, apparently, to irrigate the delta of the Nile sufficiently to supplement the periodical rainfall. What I would ask Captain Lyons to tell is, whether any measures are in prospect in the immediate future for dealing with the difficulty of the Bahr-el-Jebel marshes—for reducing their area and for preventing the Sobat waters from ponding back? I suppose no measures could be taken for lessening the seepage from the middle course of the Nile between Abu Hamed and the second cataract. So long as the Earth is made as it is at present, and we have those remarkable depressions on the west of the Nile, there will be a constant leakage of water. In general, will he tell us whether the Egyptian Government sees its way, in connection with the Sudan Government, to dealing with those problems in so far as the country above the dam is concerned? I gather (it is a new fact to me) that the official explanation of the remarkable series of low Niles, which we have had now for a good many years, is that there were, in each of these years, certain meteorological conditions which caused an interruption of the Abyssinian rainfall for a certain time, and lowered the amount of water discharged into the river by about one-tenth. It is a very remarkable run of bad luck, and perhaps Captain Lyons can find time to explain to us how this unfortunate condition of things has occurred, that, for some six or seven years, the Nile has constantly fallen below what is considered an average flood, with the exception, of course, of last year, when the deficiency was made up by an unusually late series of storms. I think, in asking those questions, I am perhaps rendering the meeting the only service of which I am capable.

Dr. STRAHAN: It has occurred to me, and I dare say to others in this room, during the course of the evening, to reflect upon the extraordinary advances in our knowledge of the valley of the Nile which have been made within our own lifetime. I have a recollection of this region as being wrapt in mystery, an unknown land; now we are told of the rainfall, the river-system, and of many details connected with them. This result is largely due, of course, to those pioneers in geography

many of whom have placed their observations before this Society, but we owe it in no small degree to the staff over which Captain Lyons so ably presides. The Nile, though not unique, is peculiar in this respect—that it derives the whole of its waters from certain definable areas in the upper parts of its basin, and that for a great part of its course it acts merely as a conduit. I suppose that a very large part of the water is lost by evaporation. It had appeared to me likely that the effect of the marshes bordering the river would be much the same as that of a lake, and would tend to equalize the flow. By clearing the channel the height and rapidity of floods would be increased, as has happened in the case of several of our own rivers, by the removal of woods and the cutting of land-drains. But in Egypt the enormous evaporation has to be considered, and it seems to be doubtful whether any considerable proportion of the water which strays into the marshes ever gets back into the channel. I should like to ask a little further information from Captain Lyons on that question. Another point that struck me was the suggestion that the remarkably small gradient of part of the Nile valley is due to earth-movement. It seems rather a large demand to make upon our belief that the crust of the Earth had bent and produced this effect, rather than that it was due to unequal erosion of rocks differing in hardness; but if we consider the configuration of that part of Africa, we shall see that the suggestion is not so wild as might appear at first sight. What, for example, is the meaning of the course pursued by the Nile, and of that remarkable gulf the Red sea? How did that gulf get there, and why did the river pursue a course roughly parallel to it, if it were not by a lowering and upheaving of the Earth's crust? Moreover, there is geological evidence that such movements have taken place. We have the remarkable depression of the Jordan and the Dead sea, with a possible further extension. We have also various rift-valleys, to which a similar origin is attributed, in neighbouring parts of Africa. We have, in fact, reason to believe that in that part of the world much of the configuration is directly due to recent movements of the Earth's crust. This is a question perhaps rather apart from the main subject of the lecture to-night, but it is one with which Captain Lyons is most fully qualified to deal. I think, in conclusion, sir, I may say that I know of no region on the face of the Earth in which geographical exploration has yielded results of greater scientific value or economic importance than in the valley of the Nile.

SIR CHARLES WATSON: Captain Lyons' paper has dealt with so many interesting facts that it is very difficult to know what to select to speak upon; but for my own part I enjoyed the paper very much, because it brought back to my mind days over thirty years ago when I was serving with the late General Gordon in the Sudan, and was making a sketch survey of those districts of which he showed us some excellent photographs. I think one of the most interesting points to which he alluded is the very curious course that the Nile has followed. If you look where it passes through the marsh region you will see that in place of going direct for the mouth of the Sobat, it takes a long bend to the west, thereby making the river longer than appears to be necessary. Then, when it comes to Khartum, in place of crossing the desert to Debbeh, it goes out of its way through the range of hills at Shabluka, when, under ordinary circumstances, you would think it would avoid that course. Then when it comes to Abu Hamed, in place of going across to Korosko, though there was not very much difficulty for the Nile to have taken that course, because it is a pretty good slope the whole way down, it takes a turn right round as you see to the south-west, and then turns again, so that the total distance that the Nile takes from Khartum to Assuan is, I believe, rather more than double the distance that it need have taken if it went in a straight line. This is very curious, and the only thing I can attribute it to is that it is a dispensation of

Providence to hold back the waters of the river and prevent them from flowing down too quickly into Egypt; in fact, it forms a series of what you may call "natural obstructions," which now the authorities in Egypt are trying to supplement by artificial dams. I hope that they will not interfere too much with the course of nature. After all, nature works very well for the benefit of man, and perhaps sometimes, with the science of modern days, we may be inclined to go a little too far in getting the better of nature. There is only one other point. It is one of great interest, and that is the system of land-measurement in Egypt. Captain Lyons has pointed out how the basis of land measures was a strip of land 100 cubits long and a cubit wide, and we should remember that that strip series of measurement of land, if we may use the expression, is not only to be found in Egypt, but also in this country, because the British system of measurement of land from the Saxon times is based upon the strip system. In this country the base strip was 440 cubits long and eleven cubits wide, and any one who has studied the Domesday Book will find that here our lands were divided exactly in the same way as Captain Lyons has pointed out the lands of the present day are divided in Egypt. Of course, we have planted hedges, and so forth, but looking at an Egyptian map, we see much the condition of things that existed in England a thousand years ago. I hope, sir, I have not been too long, and I can only say that I have heard with the greatest pleasure the paper by Captain Lyons, and I am sure we shall all profit by it.

THE PRESIDENT: I am quite sure that any one who has even superficially studied Egyptian hydrography must see how important are the problems with which we are dealing to-night, for there is no other country on the face of the Earth but Egypt which is absolutely dependent for its very existence on the bounty of one river. The belief in the exceptional nature of these problems must have been increased by the interesting paper we have just listened to, and also by the discussion. I do not intend, not being an expert, to continue the discussion. I have, it is true, at times wondered whether it was not possible to use the huge equatorial lakes as great reservoirs, and thus get an ample supply of water for Egypt. I presume that this is impossible for two reasons. In the first place, I imagine the engineering difficulty connected with making a dam, enabling a sufficient quantity of water to be drawn off, may be insuperable; and, even if this is not the case, that the effect of using those lakes as reservoirs would merely be to fill up the marshes, and in the end very little good would result to Egypt itself. I merely rise, in your name, as I am quite sure I may, to express not only our thanks to the lecturer for his lecture, but to encourage him in every possible way to proceed in his admirable series of investigations. No man can possibly predict how much the future prosperity of Egypt depends on the scientific investigations of to-day.

MR. BURGESS: I should like to ask one question with regard to those diagrams which Captain Lyons showed us, and that is, if he would explain why those depressions which occurred in such regularity, I suppose on the western bank of the Nile, were always on the one side of the river, and not on the other?

CAPTAIN LYONS: I will very briefly reply, so far as in my power, to the points that have been raised. Regarding the long and narrow holdings, Sir George Darwin referred to, it is the predominant form of holding in Egypt. It is a very usual form of land-holding—the long plough furrow, of narrow width, but there is an additional reason in Egypt because of the necessity for each landowner to have a portion of his land on the supplying water-channel, and naturally, with very long and narrow holdings, more landowners will have a frontage on the water-channel. Mr. Hogarth asked about the steps which were being taken to obtain

a larger water-supply. That falls in the province of the Sudan Irrigation Service, which has been, and is still, at work, collecting and compiling information on the plains of the Sudan, and also in the investigation of the country bordering the rivers. The marshes of the Bahr el Jebel have been largely surveyed, and the area of those marshes is found to be less than was at one time believed. The water that leaves the river by seepage is not altogether lost, for a part of that which at high flood has soaked into the alluvial plain through which the river flows, returns at the lowest stage when the level of the river has fallen below that of the water-level in the flood-plain. I can only refer very briefly to the low floods of recent years, for the matter is part and parcel of the whole Indian ocean monsoon, and I am afraid it is too late to go into the matter this evening. It is a very big meteorological question, at which the meteorologists of India and Australia are steadily working, and to which we in Egypt are endeavouring to contribute. Of the water that goes on to the flood-plains of the Bahr el Jebel, which are largely occupied by lagoons and other depressions, but little can return to the river, since at the lowest stage 21,000 cubic feet per second is passing Gondokoro, and only about 12,000 reaches Lake No at the lower end, so at the lowest stage there is a loss of over 40 per cent. Sir Charles Watson referred to his survey of that river in 1874, a survey that was most useful to me when I was making one in 1901 and 1903, for it enabled me to compare the river's course at an interval of about thirty years, and it afforded very valuable evidence that so far from being a very unstable stream, to all intents and purposes the channel had not greatly altered. The reason of the great bends of the Nile is an interesting question, and one which will not, I am afraid, be solved for some time. The solution of it must depend largely on geological evidence. I believe that we have in the Nile course of to-day a collection of drainage systems from which the present single system with its peculiarities has been developed. As to the depressions on one side of the Nile only, I am afraid that is due to the point at which the section has been taken. Thank you very much for the very kind way in which you have received my paper.

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## THE FIRST CIRCUIT ROUND AFRICA, AND THE SUPPOSED RECORD OF IT.\*

By Prof. W. M. FLINDERS PETRIE, D.C.L., LL.D., F.R.S., M.B.A.

THE French Academy of Inscriptions and Belles Lettres has recently received communications from M. Moret and Dr. Capart on monuments which, if genuine, would have been of the highest interest; but it is now believed that they rather have the interest of one of the most skilful forgeries that has yet come to light. The original inscriptions are engraved upon large figures of the Egyptian scarabæus. Such a vehicle for historical records in Egypt is already familiar. The present examples are later than others, larger, carved in limestone, and but roughly shaped on the back. In these points they are peculiar, but

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\* Although the inscriptions on these scarabs have been thoroughly discredited, it seems desirable to place the facts on record.—ED. G. J.

these are not grounds for doubting their genuineness. The lesser scarab measures 8 inches by  $5\frac{1}{2}$  inches, and bears fifteen lines of hieroglyphic inscription; the greater scarab measures 8 inches by  $6\frac{1}{2}$  inches,



THE LESSER SCARAB.

and bears fifteen lines of inscription. Both are dated from the twelfth year of Pharaoh Necho, 599 B.C. The inscriptions are translated by Dr. Capart as follow :—

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*Lesser Scarab.*

"Year . . . . under the majesty of the Horus Saa-ab, lord of the two crowns Maa-kheru, the Golden Horus loved by the Gods, King of the South and the North, UAHM-AB-RI, Son of the Sun, NEKAU who gives life like the Sun eternally, loved by the goddess Bast the great, mistress of Bubastis, eye of Ri master of Heaven, mistress of all the gods. . . . This day came one to tell his majesty 'Behold the envoy which thou hast sent to make the circuit of the hidden land has landed on the shore of Egypt. He comes in peace to report to his Majesty on what he has done since he left this land.' His Majesty said, 'Hasten to bring him to me.' This envoy came to the place where his Majesty was, he smelt the ground before his Majesty, and he told him all the marvels which happened to him while he went round this land in all its circuit. His Majesty commanded an account to be made of all the things that he had seen. Never was such a thing seen before. His Majesty presented many tributes brought from these countries to his mother the goddess Bast, mistress of Bubastis, eye of Ri. . . ."

*Greater Scarab.*

"The hereditary prince, the royal seal bearer, the lordly companion beloved, lord under the king of Upper Egypt, chief under the king of Lower Egypt, the great chief of the waterways, head of the fleet of Pharaoh, Peduneit. He says, 'I, the royal envoy, navigated in the great sea for his master. I was ordered by his Majesty to open the ways to the lands which were unknown to those who were before. In the year VIII, Phamenoth the 24th, I took the good way to the land of Ta-nuter. I landed in peace at the land of Punt in Paehons (day?). I arrived at the sea on the eleventh day. I went on in sailing south, navigating month after month to the south for the space of a year and seven months. I arrived at the "horn of the earth." I left the land of the living. Never knew I what place I existed in. I navigated many days after this, lacking my heart. I ended at the land of Egypt. I came in peace with very much tribute. I landed at Bubastis in satisfaction of heart in year XII, Paophi the 5th, under the Majesty of the king of Upper and Lower Egypt, UAHM-AB-RI, Son of the Sun, NEKAU, who gives life eternally.' Never a like thing has been done before by any royal envoy. His Majesty ordered an account to be written of all the things seen by the royal envoy in his going round this land in all its circuit. And this monument remains on a royal decree in the temple of (Bubastis?) to proclaim his name on earth eternally for ever."

The essential facts of these documents, from a geographical point of view, are that Peduneit, an Egyptian admiral, set sail on August 13, 603 B.C.; went down the Red sea to about Aden or Somaliland, by about October 1, 603; stayed there eleven days; went on south month after month for nineteen months till May, 601 B.C., when he reached the

tip of the world; then, passing the desolate western deserts, he came back round the circuit of Africa in twenty-one months more to Egypt by February 27, 599 B.C. This implies sailing about 30 miles a day



THE GREATER SCARAB.

down the Red Sea,  $8\frac{1}{2}$  miles a day down the east coast, and  $14\frac{1}{2}$  miles a day up the west coast and Mediterranean.

Naturally we compare the report given by Herodotus (iv. 43). "Libya shows itself to be surrounded by water, except so much of it as borders upon Asia. Neko, king of Egypt, was the first whom we know of that proved this; he, when he had ceased digging the canal leading from the Nile to the Arabian gulf, sent certain Phœnicians in ships, with orders to sail back through the Pillars of Hercules into the northern sea (Mediterranean) and so to return to Egypt. The Phœnicians accordingly, setting out from the Red sea, navigated the southern sea; when autumn came, they went ashore, and sowed the land, by whatever part of Libya they happened to be sailing, and waited for harvest; then having reaped the corn, they put to sea again. When two years had thus passed, in the third, having doubled the Pillars of Hercules, they arrived in Egypt, and related what to me does not seem credible, but may to others, that as they sailed round Libya, they had the sun on their right hand." The date of the voyage, after the making of the Nile-Suez canal, agrees to the eighth year of the inscription. The direction also agrees. The command being given to Phœnicians, seems at first contradicted by the Egyptian name of the admiral, Peduneit (the gift of Neith). But Egyptian names were commonly taken by foreign officers in the service; and there is preserved in the Cairo museum a statuette of Neith dedicated by a Peduneit, with a Karian inscription, proving that a foreigner of importance took the name of Peduneit sometime during the previous reign. This may well be the foreign or Phœnician admiral of Herodotus. The account of settling for cultivation each year agrees to the general rate of sailing, being only a third or a half of the rate recorded at the beginning of the voyage. The only discrepancy is in the statement of under three years being occupied instead of three and a half years in the inscription. This statement comes immediately after the record of harvesting, and was a slight slip in attributing the number of harvests to the whole length of the voyage. The vessel must have carried a year's grain, to last from one harvest to the next. The stores would be filled up in October, 603, at Punt; the first harvest would be on the east coast about the autumn of 602; passing the Cape in May, 601, the second harvest would be on the west coast about the end of 601; then the Mediterranean would be reached in the latter part of 600, as they landed in Egypt by February 27, 599. Hence the ample supplies of Spain would obviate the need of waiting for a third harvest at the end of 600 B.C. The account of two harvests, "when two years had thus passed" in cultivation, exactly agrees with the contemporary inscription.

So far we see that there is no ground for doubting these scarabs on their internal evidence. But the vast stores of references collected for the new hieroglyphic dictionary at Berlin have enabled the construction of the documents to be tracked. They are found to consist of many

passages identical with those in published inscriptions, connected by other unknown passages. The grammar and usage of words is in many cases unusual and faulty, judging from common usage. Now, all this might occur in any inscription, or a modern letter; but the serious fact is that all the apparent faults occur in the connecting passages which are without a published source. This marked difference of correctness between the parts which have a precedent and those which are without precedent, appears to make evident their nature as a modern forgery. And it is stated that the material is lithographic and not Egyptian limestone. Yet the fabrication is marvellously good; the hieroglyphics are beautifully cut, true to the style of the period named, and they show a better appreciation of the forms than is to be found in any usual copies by scholars.

The surrounding facts are that the scarabs were sold by the widow of the late Egyptologist M. Buriant, formerly head of the French School in Egypt, as having been bought by him. He died in 1902, but one of the parallel inscriptions was not published till 1906. All the published parallels are in French works. So long as the presumption is that these are of modern make, a doubt will hang over many inscriptions that may come forward without a clear history of their discovery. The authentication obtained by regular excavation is more necessary now than ever before.

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## THE SWEDISH MAGELLANIAN EXPEDITION, 1907-1909: PRELIMINARY REPORTS.\*

By CARL SCOTTSBERG, D.Sc., Leader of the Expedition.

### III. A SURVEY OF THE GREAT OTWAY AND SKYRING WATERS.

ONLY a few years ago, the largest part of what is to-day known as the western continuation of Skyring water was a *terra incognita*. The Swedish Antarctic Expedition once intended to visit the place; this, however, became impossible. Long ago the Chilean Government had started a geographical survey in order to get a complete sea-chart, but the Peruvian war in 1878 postponed the work, and only a short time ago the map was published. The work yielded good results: Captain Gajardo discovered the narrow channel now bearing his name, and uniting Skyring with the Xaultegua gulf, a geographical discovery of very great importance.

No naturalists, however, formed part of the Chilean survey, and it is quite natural that Otway and Skyring channel should highly attract the attention of our expedition. Thus we felt very happy when the

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\* See *Geographical Journal*, vol. 31, p. 640.

Chilean Government offered us the *Huemul* once more, with coal and provisions for the voyage.

We left Punta Arenas on April 11, 1908, and entered Otway water through the Jerome channel. After having visited several places there, we made for the Fitzroy channel, the connection—and a very narrow one indeed—between Otway and Skyring. In Skyring many of the inlets were visited, as well as the Gajardo channel; this not being navigable except with small boats, we had to return the same way. On our way back we had the misfortune to break the propellor shaft; as it was in the narrow Jerome channel, on a pitch-dark night and with a strong current, our situation looked rather awkward at first. We managed, however, to anchor in a very little-known bay, Bahía Arauz, repaired the shaft provisionally, and reached Punta Arenas without further adventure on May 4.

From the geographical point of view, a journey through Otway and Skyring offers a great deal of interest. One has there an almost unique opportunity of studying the landscape, from the flat pampa round Fitzroy channel to the high cordillera in West Skyring, and a geologist as well as a botanist can never get a more satisfactory section through the east part of the great mountain chain than here. West Skyring is of much the same nature as the Patagonian channels—narrow inlets with steep shores cut deep in the bed, and in the south-west splendid glaciers reach the level of the sea. These narrow inlets are remarkable, their entrance being narrow and shallow, from a barrier of rock covered more or less with morainic deposits, which makes it impossible to cross but with small boats. On the other side of the barrier deep water is found once more. Thus these inlets may be considered as true fiords, their origin probably offering the same problems as the famous Norwegian fiords. In one case the isolation of the inner part had gone so far that this part (several miles in length) had fresh water; this is the Glacier sound (*Estero de los Ventisqueros*), where an extensive glacier comes down from the ice and snow fields in the interior of the Muñoz Gamero peninsula. The Gajardo channel is no exception to the rule; it also has a narrow part, with very little water. The tide runs here at least 8 miles, forming tremendous rapids round the rocks and boulders. We passed in a boat with great difficulty, and not at all without danger.

The mention of Gajardo channel makes me say a few words about the hydrography of Skyring. Fitzroy and Gajardo channels are the only and very narrow connections between other waters and Skyring, which has an abundant supply of fresh water in the form of ice and rain. The tide does not turn at the same time in Fitzroy and in Gajardo, being three hours later at the latter, according to information I have got. Subsequently Skyring has brackish water and almost no tides, the largest difference observed between high and low water

being only 15 centimetres. As our expedition is not provided with instruments for hydrographical work, I am only able to make these few remarks on a subject of such interest that it would be well worthy of a separate investigation.

From time to time Skyring is visited by the canoe Indians from the Patagonian channels. We found the skeletons of their native huts on many places, but never met them. Later I got to know that they came there later in the year, in June or July. Skyring water, where the shells are small and scarce, and the tidal region with rich supplies of food wanting, can never be of any importance for the Indians. To judge from the shells found round the camping-places, they carry provisions with them.

It was very interesting indeed to find the track they follow when they go to Skyring. They come from Obstruction sound, an inlet separated from Skyring by a narrow isthmus. On this isthmus there are two or probably three small lagoons, intersected by narrow strips of land. In Skyring, the road—we are right in calling it so—ends in Excelsior sound, from which we followed it up to the first lagoon. So well was it hidden that we could hardly find the entrance. It is cut through the forest in a deep and narrow *quebrada*, and its whole length—about 1100 feet—is laid with small sticks at a distance of 3 to 4 feet from each other, thus making it possible to drag the heavy canoes along.

*Geology.*—The petrographer, Mr. P. D. Quensel, as well as the palæontologist, Mr. J. Halle, had both a vast field for their work. Here I only quote the following short remarks:—

“Otway and Skyring both offer a splendid opportunity for getting a geological section from the Pampa, with its Tertiary horizontal beds, to the Cordillera with its disturbed and folded layers and eruptive rocks. The same series of porphyries, found before on the north side of the Azopardo valley, was also met with here in the crystalline state. In the Cordillera Pinto I discovered a remarkable rock of foyaitic nature” (Quensel). “The Tertiary beds in the east are richly fossiliferous. At Mina Marta and Mina Magdalena I made very good collections of Tertiary plants, partially the same as near Rio de los Minas near Punta Arenas, partially new and probably undescribed. They occur in connection with lignite-beds. Farther to the west, on the line Puerto Altamirano—Punta Roccalosa, appear the Cretaceous somewhat disturbed layers not known before from this part, and containing many fossil marine animals, mostly Gastropoda” (Halle).

*Botany.*—As showing all the transitions between the treeless pampa and the typical rain forest, Otway and Skyring are of great advantage for phytogeographical studies. From the west to the east it is possible to distinguish the following types: (1) *Nothofagus-bituloides* forest (typical rain-forest); (2) a mixed forest of this species and *N. pumilio*; (3) *N. pumilio* forest; (4) *N. antarctica* forest; (5) Steppe.

In Skyring and Otway various important plants reach their southern limit, as, e.g., *Pseudopanax latevirens*, *Tepualia stipularis*, *Gunnera chilensis* (the famous giant "pangue"), and *Dacrydium Jonkii*.

Of a certain importance was the survey of the vegetation in the vicinity of the great glaciers. Close to the ice grows quite a number of alpine plants, at the very sea-level, and the first arboreous vegetation is represented by *Nothofagus antarctica*, the same species that constitutes the forest at its vertical limit on the mountain-slopes.

That the peculiar conditions in Skyring water should act upon the constitution of the marine flora, seems quite natural. Already in Otway one notes a certain poverty in species, but the flora there is rich in comparison with that of Skyring. As there are practically no tides, the littoral flora is exceedingly poor. And the freshness of the water has made the sublittoral *Macrocystis* formation disappear, an association that otherwise never seems to lack round subantarctic shores. The most common aquatic plant in Skyring is a *Ruppia*, forming extensive submarine meadows.

In Fitzroy channel, as well as in Gajardo channel, the typical algae reappear, the Corallinaceæ again cover the stones, and the great kelp floats along on the surface.

*Zoology.*—The influence of the brackish water in Skyring upon the fauna is easy to recognize. Almost all the characteristic and common Magellanic creatures have disappeared. But one need not go farther than the Fitzroy channel, and the dredge will bring up a rich harvest.

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## THE UGANDA-CONGO BOUNDARY COMMISSION.\*

### SUMMARY REPORT.

By Major R. G. T. BRIGHT, C.M.G.

DURING the work of the British Section of the recent Anglo-Congolese Boundary Commission for the survey of the country on the western border of the Uganda Protectorate, a survey was completed of the country in the vicinity of the 30th meridian east of Greenwich from lat. S. 1°, and extending westwards to the river Ruchuro, to nearly the second parallel of north latitude. The eastern shore of Lake Albert Edward and the whole of its north-easterly arm, called on maps Lake Ruisamba or Dweru, was mapped. The river Semliki was followed throughout its course from Lake Albert Edward to Lake Albert. All the eastern shore of the latter up to the Victoria Nile was surveyed, and a great portion also of its opposite side.

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\* At one of the meetings during the new session Major Bright will give a full account of the results of this expedition, which will be accompanied by a map.

As much as possible was done to delineate the features of Mount Ruwenzori, and it may be said that it was mapped up to its snow-line. Higher than that it was not considered necessary to go, nor would it have been practicable to survey in the snow-covered regions without special equipment. But little of the country passed through can be said to be absolutely unknown. Various explorers have travelled through it and made maps, though but only two can be said to have done really accurate surveys, and these are His Royal Highness the Duke of the Abruzzi on Ruwenzori and Captain T. T. Behrens, Royal Engineers, who, during the Anglo-German Boundary Commission in Uganda, made a map of the eastern shore of Lake Albert Edward. The results obtained by the recent Boundary Commission agreed very closely with those obtained by these gentlemen.

The principal physical features of the country traversed by the commission, in addition to those previously mentioned, are the highlands of the western part of Ankoli, the arm of the great Ituri forest in the Semliki valley, the Bulegga uplands on the Nile-Congo watershed, the escarpment bordering the eastern shore of Lake Albert, and the Victoria Nile. Extending from a little north of lat. S.  $1^{\circ}$  to as far as can be seen southwards, is a wild mountainous country, the peaks of which range from 6000 to 8000 feet above mean sea-level. North of this region, though still keeping a highland character, it is open and less wooded. The soil appears to be rich and productive, and the climate is cool and healthy. It is here chiefly a pasture country, inhabited by Bahima.

The two lakes Albert Edward and Albert are very similar in surroundings and character. Each has the appearance of a shallow lake, occupying a portion of what must once have been its bed. In Chaangu, on the west of Lake Albert Edward, rises a range of mountains reaching over 8000 feet in height. The Semliki flows out of the north end of Lake Albert Edward, and is throughout its course a fine broad river varying from 60 to 100 yards in width. It is broken in places by cataracts and rapids. Its total fall is about 960 feet in its length of 155 miles, from 3000 feet, the height of Albert Edward, to 2037 feet, the level of Lake Albert. The eastern extremity of the great equatorial forest is often of the greatest density, though not always tropical in character. It extends unbroken from the higher slopes of Ruwenzori across the Semliki valley, and away to the west.

Lying between the Semliki valley and the plateau to the north of the Lake Albert Edward depression is the long ridge of Ruwenzori. The snow-peaks of Ruwenzori, which form such a striking and curious feature in close proximity to the equator, are comprised in an area of some 55 square miles in the central part of the mountain. They consist of three main groups or "massifs." North of these are two smaller peaks, and south is a chain of lower heights. The height obtained for

the summit was 16,794 feet, former heights being by H.B.H. The Duke of the Abruzzi, 16,815 feet, and by Captain Behrens, 16,618 feet. The snow-line in the valleys comes as low as 13,200 feet, but on the peaks it appears to be higher. No peak was observed of a less altitude than 14,700 feet that had snow on it, except occasionally and temporarily.

On the west of Lake Albert, the mountains, which rise to an altitude of 7000 feet and over, fall sheer into the water along its whole extent, save at the south end, where there is a plain between the lake and the hills. On the east of the lake is a similar steep escarpment, commencing from the northern slopes of Ruwenzori, and rising abruptly from the flat Semliki plains; this gradually diminishes, and, eventually leaving the Albert, terminates near the Victoria Nile.

On the west of the Semliki valley is the Nile-Congo watershed. Hills rise, forest-clad up to Mboga; north of that settlement, they become open grassland and are known as the Bulegga hills. This is a cool and pleasant district, fertile and inhabited by cattle-owning natives. From where the watershed approaches the lake (and it is within a few miles of it), it becomes, in that part which lies within the Uganda Protectorate, thinly populated and difficult for travelling.

But few portions of the country which was seen by the commission were uninhabited. In the southern regions (Ankoli) the population can be roughly classified as the Bahima, the aristocracy, and the Bæro, the cultivators and serfs. When the Galla invaders came down from the north they established a powerful branch of the Hamitic family in Ankoli. The Bæro, on the contrary, are a distinctly Bantu race. The fact that for years they have supplied the Bahima nobles with concubines has done much to spread the Galla blood, but still there can be no doubt that the Bæro are a negroid and inferior people. The hilly country to the south of Lake Albert Edward is tenanted by the Basiggi or Bachigga. This tribe is of Bæro stock, but of a lower degree of civilization. They have no chiefs, but manage their affairs by families. A sect of witch doctresses, which calls itself Niawingi, has obtained great influence in the more remote districts. This power is unfortunately hostile to European influence, and is mainly used to stir up strife.

The Semliki forest is inhabited by the Baamba, a Bantu race. This tribe is addicted to cannibalism, and constant warfare goes on between village and village. The Baamba, however, greatly fear the pygmies who live near them. These little people prey on the crops of their larger neighbours, but in return do them service when fighting or hunting. The Batwa or Bambutu inhabit the forest. They stand about 4 feet high, and are long-armed, short-legged, and ugly, being usually distinctly prognathous. They have no religion and no industries. No attempt is made to cultivate, but they depend entirely on game and what they can steal from their neighbours. The Banande appear to be related to the pygmies, but not of them. They are bigger and more

Simian in appearance. It seems that they are absolute pariahs, and are found hanging around the Baamba or Bavira villages, literally living on what they can pick up.

In the country between the Nile-Congo watershed and Lake Albert the inhabitants differ widely. The Balegga and Bavira are closely allied. Their physique is finer than the natives of either Ankoli or Toro; they belong to the Bantu race. Except that these natives occasionally spear or shoot a man, belonging to some other chief, with an arrow, they are a friendly and pleasant people. Their neighbours, the Lendu, are Nilotic. They are warlike, and are continually fighting with each other or any one else they think themselves strong enough to overcome. There is little intercourse between the Lendu and Balegga.

Generally speaking, the country passed is occupied by a mass of granite and gneiss and a series of crystalline rocks of indeterminate age, overlain in the sunken areas of Lake Albert Edward and the Semliki valley and in the depression containing the north-east extension of Lake Albert Edward by alluvium, and in four small detached districts by volcanic rocks. The high plateau to the east of Lake Albert Edward and Ruwenzori consists mainly of gneiss, with intercalations of schistose rocks of various kinds and bands of quartzite. The Balegga plateau is a mass of granite, intersected by numerous basic dykes, and bordered on the south-east by a zone of gneissose and schistose rocks, with some accompanying fault-breccias, which afford evidence of the faulting and subsidence which have occurred there. The foothills of Ruwenzori consist similarly of quartzite, quartzose schists, sheared quartz-felspar rocks, and gneiss of various types, with intercalations of epidiorite and amphibolite schist, all dipping vertically and striking generally in the direction of the range. Volcanic rocks occur in the four districts of Kichwamba, Katwe, Kyatwa, and Fort Portal. A large quantity of salt is extracted by the natives from the Katwe salt lake. The salt seems to be derived from certain bands of tuff by percolating surface water, which rises as springs in the bed of the lake.

The open plains to the south of Lake Albert Edward were covered with game. Uganda cob (*C. Thomasi*) were found in great numbers. The river Ruchuro swarms with hippopotamuses, which are left severely alone by the natives, though in the river they might be attacked with little or no danger. A curious feature of the Albert Edward is the great number of dead fish that are found floating on the surface. The natives say that they die from bad water. This lake is usually supposed to be quite free from crocodiles. The country between the Congolese stations Kasindi and Beni is an ideal elephant country, and is tenanted by some large herds. In the thick forest west of the Semliki valley elephant and buffalo were plentiful, but, excepting parrots, there was very little bird-life. On the Congo-Nile watershed in the neighbourhood of Lake Albert there is practically no animal-life. A small herd

of red Congo buffalo (*Bos Caffer Nanus*) was seen in the Semliki forest.

Throughout the commission, with the exception of the north-easterly shore of Lake Albert, no cases of sleeping sickness were seen. Unfortunately, this is no guarantee that the country will continue free from the disease. Tsetse-fly belts are common along the lake-shores, wherever bush comes near the water's edge and spreads up the banks of the streams flowing into the lakes.

The staff of the British section were: Major (temporary Lieut.-Colonel) R. G. T. Bright, C.M.G., Rifle Brigade; Captain E. M. Jack, R.E.; Captain the Honble. F. Prittie, Rifle Brigade; Mr. C. Chevallier; and Captain A. MacGregor and Captain S. Iredell of the King's African Rifles, Mr. J. Coates, and Mr. G. McCaw, and four British non-commissioned officers.

The commission started triangulation from two points fixed by the Anglo-German Boundary Commission (Uganda). These positions were obtained by a continuous triangulation from Zanzibar, the longitude of that place having been determined by telegraph some years previously. In the British calculations Clarke's figure of the Earth was used. The main triangulation on the east followed generally the line of the 30th meridian, on the west it extended to the river Ruchuro and the east shore of Lake Albert Edward. It was extended eastward to include the north-east branch of that lake, and from there passed northwards round and across the northern slopes of Ruwenzori. From the neighbourhood of the northern shore of Lake Albert Edward, the triangulation was extended to the west of Ruwenzori, and closed with a point of the eastern triangulation on the northern spur. North of this junction it was continued to the Congo-Nile watershed; then north-eastwards along the western shore of Lake Albert nearly as far as lat. N. 2°. A rapid triangulation, connected with the main triangulation, was carried along the eastern shore of Lake Albert to the vicinity of the Victoria Nile.

During the work of the commission a scheme was prepared for the geodetic measurement of the 30th meridian, and when the actual survey of the boundary zone was completed, the measurement of the arc was commenced. The topography was carried out on the scale of 1:250,000. Plane-tables were used throughout, with Indian pattern clinometers, except in the dense forest, where traverses between fixed points were made with the prismatic compass. Over twenty prominent peaks of Ruwenzori were fixed trigonometrically, including eleven above the snow-line. Of these eight were previously mapped by H.R.H. The Duke of the Abruzzi, and the positions agreed closely with his. Two check-bases were measured. The Invar-Jäderin apparatus was used, this having been brought out for subsequent use on geodetic work. At two positions astronomical observations were also taken for latitude and azimuth. The results, though quite discordant with the triangulation

latitudes, are of scientific interest. The large mass of Ruwenzori is the cause of the local attraction, and is probably enough to account for the differences.

### LEVELLING BETWEEN THE NILE AND CONGO BASINS.\*

As was pointed out by Captain Behrens in his paper printed in the *Journal* for March, 1907, precise data for a knowledge of the altitudes of the lakes and other surface features of Equatorial Africa have been gradually accumulating within recent years, thanks to the careful observations carried out by various boundary or railway surveys. Some addition to our knowledge in this respect has been made by the surveys undertaken on behalf of the Congo State along the lines of projected railways in the region between the upper Nile and the Congo. Through the courtesy of M. Liebrechts, Secrétaire-Général du Département de l'Intérieur du Congo, copies of the maps showing the results of these surveys have been forwarded to us through Captain S. F. Newcombe, R.E., an officer in the service of the Sudan Government, who has accompanied them with some explanatory notes. The map given with the present number is a reduction from the Belgian maps.

It will be seen that three different lines of levels are included. The first of these, shown in the lower part of the sheet in sects. I.-III., runs along the western bank of the Nile from Dufile to Rejaf, connecting the navigable portions of the river above and below the rapids. The sheets of the Belgian map were plotted on the scale of 1:20,000, but this has been reduced in our map to that of 1:250,000. The two other lines are those from Stanleyville on the Congo to the Albert Nyanza via the upper Ituri, and from Tanganyika to the upper Ituri, connecting with the first. They are shown together on the main portion of the sheet, on the scale of 1:2,000,000, or half of that on which the original surveys were combined in the Belgian map sent to us. A note on this last explains that the separate sections were constructed on different magnetic meridians, but that in the absence of definite information as to the amount of declination in each case, the original orientation of each has been retained. In preparing the accompanying map the draughtsman has, however, adapted the separate sections of the traverse to positions taken from the best existing maps.

In the Belgian survey between the Congo and the Albert Nyanza the altitudes were referred to the starting-point at Stanleyville as a base. The altitude of this has been fixed instrumentally from the West Coast as 430 metres, or 1351 feet, and on this basis the altitude of the Albert lake is given by the Belgian survey as 639 metres, or 2096 feet. This figure differs by 59 feet from that adopted at the

\* Map, p. 548.

British War Office on the basis of levelling from the east, to which reference has already been made in the *Journal* (vol. 30, p. 219; vol. 32, p. 85). It has therefore seemed best (in the absence of information respecting the degree of precision attaching to the determination of the altitude of Stanleyville) to accept the British value in the case of Lake Albert,\* and to apply a constant correction of -59 feet to the Belgian values along the line from Stanleyville to that lake. In the case of the line to Tanganyika, the Belgian traverse gives the difference of level between this lake and the Albert Nyanza as 171 metres, or 561 feet, the altitude of Tanganyika appearing as 810 metres, or 2658 feet, which, on the basis of the English value for the height of the Albert lake, will be reduced to 2599 feet. But, as Captain Behrens has shown (*Journal*, vol. 29, p. 213), the trigonometrically determined height of Tanganyika is 2624 feet; this figure has therefore been adopted in our map, the required correction being distributed proportionally over the various stations between that lake and the junction with the Stanleyville—Lake Albert line. Unfortunately, the surveyors do not appear to have connected their line of levels with the surfaces of Lakes Kivu and Albert Edward, the heights of which have therefore been supplied from Captain Behrens' figures.

As regards the line from Dufile to Rejaf, it does not appear what base of reference has been used by the Belgian surveyors. We have therefore adjusted their figures to the altitude of Dufile as deduced from that of the Albert Nyanza (allowing for the probable slope of the intervening section of the Nile), and to the best available altitude of Rejaf. The Belgian surveyors also give a table showing the exact distribution of rapids and navigable water between Dufile and Rejaf, distinguishing also between lesser rapids and greater rapids and falls. Out of the whole distance of 173 kilometres (108 miles), 39 (24 miles) are taken up with lesser rapids (made up of twenty separate stretches of broken water) and 12 (7½ miles) of greater rapids and falls (in five different sections). The Congo Government use steel boats between Kaia and Rejaf, carrying 2 tons each. These pass through the formidable Bedden rapids.

Captain Newcombe points out that between Irumu and the Semliki, going south, the watershed appears to be very low, the highest point being shown as 1161 metres (3810 feet). The fall from this point to the Semliki cannot be exceptionally difficult. On the other hand, there is a fall to the Albert Nyanza near Mahagi from 2040 metres (6693 feet) to 639 metres (2096 feet). Up to Irumu the Ituri is obviously not steep, but north of that point the rivers descend rapidly.

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\* It may be well to point out that the altitude 2096 feet given in our map for a point in the immediate neighbourhood of the Albert lake does not refer to the lake surface, although, by a pure coincidence, the figure is the same as that given by the Belgian traverse to the lake itself. The point is 59 feet above the lake, which happens to be exactly the amount of the correction above referred to.

## FURTHER EXPLORATION IN THE HUNZA-NAGAR AND THE HISPAR GLACIER.\*

By Mrs. FANNY BULLOCK WORKMAN.

DR. HUNTER WORKMAN and myself, accompanied by Dr. C. Calciati and Dr. M. Koneza—former pupils of Prof. Jean Brunhes and graduates of the University of Fribourg, Switzerland—as topographers, Cyprian Savoye, guide of Courmayeur, and three Italian porters, have finished a very interesting visit to Hunzar-Nagar and the Hispar glacier. The object of the expedition, in particular, was to make a detailed survey of all the branches of this glacier, and explore them to their sources, this not having been done by Sir Martin Conway in his rapid ascent of the Hispar in 1892. Being favoured generally with very fine weather, this plan was to a large extent successfully accomplished.

Careful note was taken of Mr. H. Hayden's stations, on behalf of the Geological Survey, at the tongues of the Hassanabad, Tengutsa, and Hispar glaciers, changes noted and all observation-points including a number in addition to those of Mr. Hayden marked in red. Special attention was given to investigation of the Nuskik La as a practicable pass for a caravan to the Basha valley. Neither of the routes over it, drawn on Sir Martin Conway's map, are at present feasible for loaded coolies. The danger from avalanches is imminent at all hours of the day. Huge séracs, and above them overhanging cornices, give way constantly, crashing down upon the route to be taken. Starting very early with guide and porters only, we visited the col and climbed a snow-summit rising 1500 feet or more above it to the east. On reaching our base-camp afterwards, the guide remarked he was glad that that climb was over, and that he should not care to incur the risk a second time. Doubtless the snow conditions have greatly changed on the Hispar side in the last fifteen years. The ascent from the south, the Baltistan side, to the col is perfectly simple, as we saw from above the pass.

Much of topographical and glaciological interest was found on the ascents of the 12 and 15 mile long northern branches, the Gutun, Kani-basar, and the highest, most northern icy branch, which ascends on the Nagar side of the Hispar pass to a col of about 19,000 feet overlooking a large enclosed glacier. The topography of these was quite different from that shown on existing maps. We made a base-camp at a height of 16,000 feet for ten days on the final mountain-flank of right bank, at the base of the last sérac leading to the Hispar or Zong La. From here, ascending north-east over ice-falls, and for some miles over a wide snow plateau, and finally up a sheer 1000-feet snow-slant, we brought

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\* Dated "Skardu, September 10, 1908."

fifteen coolies and small camp to a snow-flat under a very sharp triangular snow-pyramid which crowns the watershed between the Hispar and Biafo glaciers. This camp was at over 19,000 feet. Our heights have not yet been finally calculated.

The next day, with guide and two porters, I ascended this peak, while Dr. Workman with a porter climbed a somewhat lower summit for photographic and observation purposes. The east arête of the higher peak, the Biafo watershed side, while less steep was so fluted with cornices that we dared not attempt it, so we climbed by the much sharper south one facing the Hispar, which was a risky, very abrupt knife-edge slant of over 2000 feet. By judicious step cutting we reached the tiny corniced top in safety. The view from this mountain is perhaps the most comprehensive and beautiful I have seen in the Himalayas. A page would not suffice to describe it, but in this note I will only say, that from its position high above Snow lake this summit, overlooking as it does the full sweeps of the Hispar and Biafo glaciers and the great peaks to the source of the Baltoro, may be said to include in its vista of a 60-mile range east and west a panorama of superlative grandeur of one of the most magnificent mountain regions of the world. We did not go to the Hispar glacier to indulge in high climbing, for the mountains are not suitable for such exploits, but I am glad I did not resist the sudden impulse to climb this peak, for I should have missed a rare hour of Himalayan mountain glory, and a view of topographical and geographical importance. The height of the mountain will probably work out at between 21,000 and 22,000 feet.

On August 16, with a caravan of Nagar coolies we crossed the Hispar pass to the Biafo glacier. The large glacier running from Snow lake south-east behind the B 15 range was investigated, and a passage looked for to the north of that range, which we hoped might lead to a possible route to the Punmah glacier, but the only available pass was found quite beyond the mountaineering capacity of loaded coolies. We descended the Biafo glacier, reaching Askole on August 25. This was our second visit to this glacier, the first having been made in 1899.

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## THE PORT OF MANCHESTER: THE INFLUENCE OF A GREAT CANAL.

By JOHN M'FARLANE, Lecturer in Geography at the University of Manchester.

THE present seems a suitable moment for reviewing the development of the port of Manchester, and for attempting to estimate the place which it holds as an importing and exporting centre. There is no doubt that the sanguine expectations of those who promoted the construction of the canal have not as yet been fulfilled. On the other hand, progress has been steady and continuous, and we would make our dominant note this—that the port of Manchester, because of its geographical

position and conditions, must continue to grow; that certain non-geographical factors which have so far retarded its growth will gradually become of less importance; and that for certain classes of goods, Manchester will eventually become the leading port in the kingdom. The Ship canal is one of the greatest geographical advantages which Manchester possesses. Its endowment in these, indeed, is not great. Temporary conditions connected with the cotton industry gave it considerable importance during the nineteenth century, but in the cotton industry the tendency was centrifugal rather than centripetal, and Manchester as a town was actually on the decline when the canal was constructed. Since then the decline has been checked and the movement reversed, while the surrounding country is gradually being more closely united to the city which is becoming its port.

The facility with which trade moves to a new port, however, varies with a number of considerations. The momentum which older ports have acquired, the organization of the traders in the commodities imported and exported, and the weight and bulk—as well as the value of these commodities—have all to be taken into account. To illustrate these factors in the development of a port and at the same time to obtain some idea of the hinterland of the port of Manchester, we propose to examine the conditions determining the distribution of some of the chief commodities introduced into the country by the Ship canal.

To Manchester people cotton is naturally the most interesting of these, and it illustrates very well some of the difficulties which prevent the rapid development of the port. At first sight it might appear that it would be through Manchester that the great bulk of the raw material required in the cotton industry would be introduced into the country. Within 12 miles of the docks more than 32 millions of the 44 millions of spindles in the United Kingdom are found, and to all the towns where these 32 millions are situated the rate for transmission of raw cotton by rail is less from Manchester than from Liverpool. To Bolton, for example, the rate including Ship canal toll and dock charges is 10s. per ton from Manchester, while the cost *via* Liverpool is 13s. 6d.—a difference of 3s. 6d. To Oldham the rate from Manchester is 9s. 9d., while from Liverpool it is 14s. 8d.—a difference of 4s. 11d. To Stockport the charges are 8s. 10d. and 12s. 8d. respectively, the difference being 3s. 10d. It is unnecessary to multiply examples. Without reflection, therefore, one might be led to suppose that the places to which cotton goes from Manchester, are the places to which the rates are less than from Liverpool. But such a supposition would be very wide of the mark. With nearly 75 per cent. of the spindles of the United Kingdom in its immediate neighbourhood, Manchester only imports about 14 per cent. of the raw material which is used, while Liverpool imports about five times as much. For this there are several reasons, the chief being of an economic nature. In the first place, there is the long-established supremacy of Liverpool as a great cotton market. That city thereby acquired a momentum which could not be seriously affected within the short period which has elapsed since the opening of the canal. At the beginning of that period, too, there was no cotton market in Manchester. The Manchester spinners had either to buy direct from the United States or go to Liverpool and buy in the market there. But there are great difficulties in buying direct from the States. Few spinners are able or willing to buy the year's supply at once. If it is bought in instalments it is impossible to ensure that the quality will be the same. When it is bought in Manchester through importers, the difficulties do not disappear. A comparatively small amount comes to this port, and although a spinner might be anxious to support the canal and at the same time effect a saving to his own pocket by purchasing in Manchester, he will frequently find either that there is no cotton on the wharf, or that it is not of the quality he requires. By going to Liverpool he is

able to obtain just what he wants. Now, although this difficulty might be got over by the establishment of a spot market in Manchester—and such a market has recently been started—a more serious obstacle has to be met. Much of the dealing in cotton is not for present, but for future delivery, and Liverpool merchants refuse to recognize the existence of Manchester. For example, if a dealer has one hundred bales of cotton in Manchester and sells them against futures held in Liverpool, they must be sent down to Liverpool. They are not tenderable in Manchester. The importer, therefore, who has sold futures to a Liverpool broker brings the cotton to that town, and from there it is distributed over the manufacturing area. Thus we have a case where geographical advantages and economic conditions stand in opposition, and it is interesting to speculate on the ultimate result. Its growth so far has been steady and considerable. As compared with 121,336 bales American cotton imported to Manchester during the season 1895-6, the quantity imported from America during the season 1907-8 amounted to 377,264 bales. The establishment of a spot market in Manchester will lead to an increase of buying in that town, and will encourage the American shipper to send his cotton there in the future to a greater extent than in the past. As the imports increase, Liverpool brokers will be forced to come to terms, and although buying and selling may continue to be done in Liverpool, much more of the actual commodity will find its way into the country by way of Manchester.

Egyptian cotton affords an interesting commentary on what had been said. Relatively a much larger amount of this goes to Manchester. One cause is that there is a good line of steamers carrying on the trade, but the chief reason is that many spinners, in order to get good cotton, buy at the beginning of the year. The Egyptian business also is simpler, and the larger houses of cotton merchants are chiefly in English hands, and are trustworthy. The spinner, therefore, has to buy early in order to get the quality which he wants, and having bought it he is sure of getting it. There is, thus, not the same reason for him going to Liverpool, and the raw cotton is brought to Manchester direct. At the present time one-half of the Egyptian cotton used in Lancashire mills is shipped to Manchester. During the season 1907-8 this amounted to 216,570 bales.

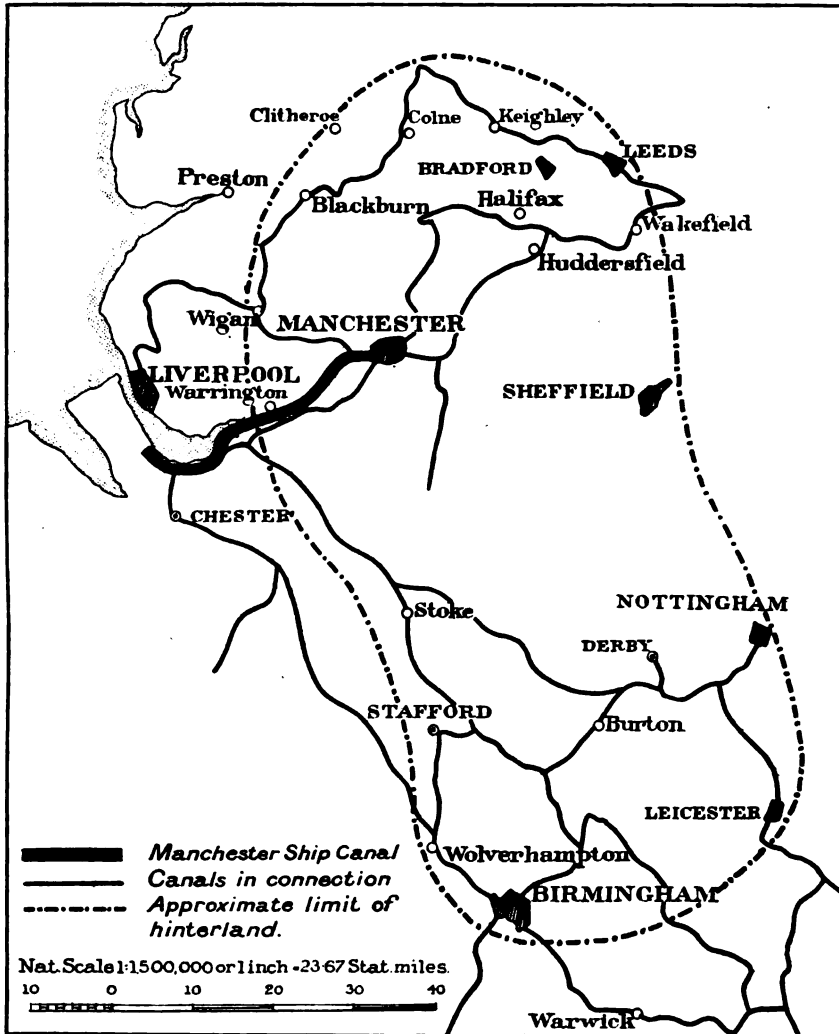
We have devoted rather more attention to cotton than we shall to the other imports of Manchester, even although cotton is not by weight the chief import, but it illustrates very well both the difficulties in determining the extent of the hinterland of the port under consideration, and the state of development in which that port at present is.

Timber is another of the chief articles of import to Manchester—by weight it is the most important. The Pennine chain forms practically the dividing line between the hinterland of Manchester and Hull for this commodity. To the east of the Pennines the greater part of the timber required in building, in the manufacture of packing-cases of all kinds, and for general purposes, consists of pine and firwood, which comes from Scandinavia and Russia—to the west of these mountains spruce and other woods from North America perform the same function, although some comes from the Baltic. The chief market for the buying and selling of timber is in Liverpool, but as it is one of these articles of which whole shiploads can be sent, the Liverpool importer frequently sends ships on to Manchester to unload. This wood is chiefly used in East Lancashire, where there is naturally a great demand. Some of it, however, does make its way as far east as Leeds and Bradford, while the market for it extends south as far as Nottingham, where the southern ports begin to compete with Manchester, which is now the eighth timber port in the United Kingdom.

Finer and harder woods, however, very seldom come to Manchester direct. These are not imported by the shipload, but in smaller quantities. The ships which bring them—say from South America—are generally Liverpool-bound

ships, and the value of the wood is such that it can easily stand the slight additional charge of carriage from that port.

During those years for which we have official figures, we find that the tonnage of raw materials used in the manufacture of paper ranks third in the list of imports by way of Manchester, and no inconsiderable part of the whole of our imports of wood pulp comes up the Ship canal. In England, paper mills are found chiefly in



HINTERLAND OF THE MANCHESTER CANAL.

Lancashire, in the West Riding of Yorkshire, and within a radius of thirty to forty miles of London, the first and the last being the districts in which the number of mills is greatest. In Lancashire the mills are concentrated, roughly speaking, within a triangular area, formed by joining together Liverpool, Manchester, and Blackburn; and, for the greater part of this region, Manchester is the port for wood pulp.

Round Blackburn and Darwen, however, the paper establishments are served chiefly by Preston; and Liverpool serves a certain part of the area contiguous to itself. But Manchester—by having rails running along the docks—is able to dispense with the additional cost of cartage from docks to railway station, and has in this way obtained a considerable hold of the trade. As far as we have been able to discover, comparatively little goes from Manchester into the West Riding. Hull seems to be the chief port for wood pulp for the country east of the Pennines. A certain amount, however, goes from Liverpool to Leeds and Worcester, probably making its way there by canal.

The grain trade of Manchester has developed very considerably within recent years. In 1895, 35,000 tons came up the canal, and in 1907 this had risen to 406,000 tons. Manchester, during the last three years, has received on an average one-fifth of the amount received by Liverpool, and somewhat more than one-twentieth of the total imports of the United Kingdom. Grain comes chiefly from the Atlantic wheat ports of North and South America, Russia, and India. So far as we have been able to discover there are no special circumstances affecting the area over which it is distributed. The number of boats bringing it being limited, it frequently happens, however, that it is introduced into this area through other ports. Local variations in price also lead to its being sent to towns on the margin, sometimes from one port and sometimes from another. Generally speaking, however, the region served—but not exclusively by Manchester—is somewhat as follows. To the west of Manchester as far as Warrington and the mills on the Weaver; northwards for about 20 miles, but certainly not beyond Blackburn, where Fleetwood competes; eastwards as far as Leeds, to which the rate is just a little more than from Hull (6s. 10d. and 6s. 3d. respectively); and southwards for about 100 miles. Leicester and Birmingham, for example, are more cheaply supplied from Manchester than from Liverpool or Hull, but are able to take advantage of the competition of the southern ports. The percentage which comes through Manchester of the total supply of different parts of the district we have, however, been unable to learn.

Fruit imports of Manchester are considerable, and as the area over which they are distributed varies from the area of distribution of other imports, a few words on the subject may not be out of place. The West Mediterranean, the West Indies, and Canada, and the United States, are the chief sources of supply. The trade from each of these illustrates the way in which a new port develops. Before the opening of the canal, and still so to a large extent, the fruit-importing business was centred in Liverpool. Manchester fruit merchants saw that if they were to reap the advantages created by the new port they would have to become their own importers, and the North of England Fruit Brokers Company, Limited, was formed. That company has established regular sailings with the West Mediterranean, and the fruit which is imported finds its way northward as far as Blackburn, into the western towns of the West Riding of Yorkshire, e.g. to Sheffield, and southward as far as Leicester, Nottingham, and Birmingham. But with regard to the East Mediterranean its trade is less important. There are several reasons for this. The company is hardly sufficiently strong to maintain regular sailings with the *Levant*. They are dependant on, say, cotton vessels from Egypt bringing parts of their produce, and a fall in the price of cotton in England may delay the sailing of a ship for a few days, with the result that damage to the fruit cargo ensues. They are, perhaps, also not sufficiently strong to meet the occasional losses sustained by those engaged in trade with the somewhat unscrupulous Levantines.

The banana trade with the West Indies and Costa Rica offers an interesting contrast. This was established after the opening of the canal, and Manchester

was fixed upon as the port of entry, because of its nearness to the source of supply on the one hand, and to a large consuming area on the other. The facilities offered by excellent warehousing accommodation and railway distribution were also important factors in determining its selection for this purpose. The whole of the bananas shipped from the West Indies and Costa Rica are landed at Manchester and Bristol, the former receiving about two-thirds of the whole, or 60,000 bunches per week. The business is in the hands of one firm, and the country is practically divided into two parts. Bristol serves the south of England, Birmingham, and London in part; Manchester serves the rest of the country, a great part of the Birmingham area, and London in part. From Manchester also bananas are sent packed in special vans to Ireland, to Hamburg, and to the Baltic countries. In this case, therefore, we have an industry able, because it is in the hands of one firm and free from complications, to avail itself of the geographical advantages of the new port.

The trade with Canada and the United States in apples is growing. Hitherto it has been somewhat handicapped by the want of more frequent sailings, but this season the Manchester Liners, Ltd., have increased their Montreal service to weekly sailings, and this will doubtless lead to an increased supply. The area of distribution is much as we have already sketched for West Mediterranean products, though American apples find their way as far as Gloucester, and occasionally—but only occasionally—to Newcastle.

The oil trade of the country is very largely in the hands of the Standard Oil Company, and may be divided roughly into that in lubricating oils, and that in illuminating oils. With regard to the first, the distribution is made from the quays, and it is difficult to get very definite information, but East Lancashire and the west part of the West Riding are the chief regions served through Manchester—apparently not very much going far south. But with regard to illuminating oils, the conditions are different. The Anglo-American Oil Company, that is, the Standard Oil Company, has mapped the whole country out into certain districts, each of which is supplied from a certain port or ports. Manchester, they say, owing to the enterprise of the Ship Canal Company, is what they recognize as a sea-board installation from which oil is distributed as far north as Lancaster, Clitheroe, and Colne, and east and south to Halifax, Huddersfield, Barnsley, Sheffield, Bawell, Derby, Nuneaton, and the Birmingham district. Liverpool, however, which is a centre in itself, distributes over the same territory. The trade in illuminating oils seems, therefore, to resemble that in West Indian bananas, inasmuch as being in the hands of one body there is no reason why the advantages of Manchester should not be utilized to their full extent.

Much of the sugar which is imported into Manchester comes from the Continent, but it is difficult to say how far it makes its way inland, nor is there any definite region which can be claimed as belonging to Manchester. But the importance of the canal has, we believe, been considerable in reducing rates for the carriage of sugar, and the cost of conveying it has been reduced over a very wide area in consequence. Liverpool refiners, for example, send their products to Manchester free of cost in order to compete with sugar refined on the Continent which is imported there. The railway rates from Goole into Lancashire are also lower in consequence. But as our trade with the Continent is very considerable, the article in question seems to be imported at many different points in England, and we understand that what is imported through Manchester is chiefly for local use. That this is so is shown by the fact that Manchester is now the second port in the kingdom for the importation of oil (London being first). Last year the imports amounted to 176,000 tons.

There is a number of miscellaneous articles which, in the aggregate, are of considerable importance, about which we have gleaned a few details. Provisions (bacon and hams, lard, cheese, butter) are imported largely from America for consumption in the thickly populated districts of East Lancashire. Manufactured iron is introduced by way of Manchester for works in Lancashire and the Black Country. Tram-rails, setts, and road materials used in the electrification of tram-way systems are imported for use in Lancashire, Yorkshire, and the Midlands.

Iron ore and pyrites are brought into Manchester in considerable quantities, and make their way as far as Leeds, Huddersfield, and Wolverhampton, and even to Birmingham, where rates with other ports are about equal.

A certain amount of wool, not considerable however, comes into Manchester for Bradford, and places like Keighley and others in the West Riding. With the establishment of regular sailings to Australia and the Argentine, there seems no reason why this should not develop to some extent.

Kaolin for the Potteries comes up the canal as far as Ellesmere port, Weston Point, and Buncorn, and is then sent on by barge to Staffordshire.

We are now in a position to draw certain conclusions of a general nature with regard to the development of the port of Manchester. In the first place, it is obvious that much depends upon the organization of the markets in which the chief imports are bought and sold. If these are loosely organized, and other conditions are not unfavourable, there seems no reason why Manchester should not import the goods in which they deal. Or, again, if these markets are so organized that the business of importing is in the hands of a single firm or combination, full advantage will be taken of the superior geographical position of Manchester. But if the organization of the market is such that it is firmly established elsewhere and cannot be moved without a certain amount of economic disturbance, there is an inertia which has to be overcome, and which will only be overcome if the geographical conditions conferred on Manchester by the Ship canal are sufficiently great.

In the second place, however, we have to notice that the articles which come most readily to a new port such as the one under consideration, are those which come in bulk. Even if the importation of a commodity is entirely in the hands of a single firm or combination, that commodity will not come up the canal if its bulk is small, and the ships which bring it to this country go, for other reasons, to Liverpool or London. On the other hand, if a whole shipload of goods of a certain kind can be sent at once to Manchester, it may go there even if the buying and selling are conducted elsewhere.

So far we have only considered imports into England through Manchester. But, of course, in considering the hinterland of a port we have to take account of exports as well. In the case of Manchester, however, these are much less important than imports. The chief export is that of coal, which goes in considerable quantities from the Lancashire coalfield. Cotton goods are sent out only in small quantities. Machinery, both from Lancashire and Yorkshire, is exported, and a certain amount of woollen manufactures finds its way from Leeds. But when we take into account the vast amount of goods manufactured within the region of the ship canal, we must confess that the exports by way of it are comparatively disappointing. There are several reasons for this. In the first place, we have to notice that ships seldom leave this country laden with one article only, and that in order for a port to have a large export trade it is essential that ships should constantly be leaving it for all parts of the world, carrying goods of all kinds. The total number of ships leaving Manchester is not yet very large, and they do not provide all the facilities which the region requires. The influence of shipping combinations has also been unfavourable, but it would not be proper to discuss this subject here.

On the other hand, the port is not without advantages of its own; the docks are connected with all the great railway systems in the country, and Manchester is the centre of an extensive system of inland canals. Further, coasting steamers coming to Manchester from other ports in the United Kingdom with goods for the surrounding district also bring goods for export abroad. For example, Plymouth steamers bring china clay for export to the cotton factories of the United States, and Dublin steamers bring ales, spirits, etc.

In conclusion, the geographical advantages of the port of Manchester are considerable, but it is handicapped at present by economic and commercial considerations, largely the result of the momentum which the older ports, and more especially Liverpool, have acquired. We cannot believe that this state of things will be permanent. Manchester will acquire a momentum of its own which will enable it to overcome the difficulties with which it is surrounded, and transform it into one of the leading ports of the kingdom.

### MR. MONCKTON'S JOURNEY ACROSS NEW GUINEA.\*

ON November 28, 1906, Mr. C. A. W. Monckton left the Mission Station on the Mambare river, "accompanied by twenty armed native constabulary, six village constables, and about a hundred carriers. . . . The major portion of my stores I sent up the Gira river to Usi village by whale-boat. The 28th, 29th, and 30th were spent in proceeding from Umi to Usi, the tracks being badly flooded. . . . On December 1 I left Usi for the Waria. The tracks were very boggy and swampy. . . . December 2: crossed Eia river at an island. This river is about 50 yards broad on each side of the island, navigable to this point, I think, for either launches or whale-boats, but flowing into German territory, and having its source in a low range near Mount Albert Edward. . . . Large numbers of rubber trees exist between the Gira and Waria, and for rubber-growing purposes the land should be highly suitable. . . . Very heavy rain fell most of the day; there is a small village, a colony from Usi, at the crossing of the Eia. Crossed Wuwu river; this river heads in swamps towards Mount Albert Edward, flowing into German territory. . . . Camped at Eatuna village on the Waria. Damadu village, at which point I appointed a village constable, is a short distance below. . . . The Damadu people . . . brought me a large quantity of taro and food, and no less than fifteen pigs, among them a number of red pigs which they said they had captured some years ago at the Wuwu river.

\* This communication is sent by Dr. C. G. Seligmann, who writes as follows (for map, see p. 328 of this volume):—

"In the September number of the *Journal*, speaking of Mr. Monckton's journey across New Guinea from the Mambare river to the Papuan gulf, you say 'the results of the expedition are embodied in our map, but no account of it is available, Mr. Monckton having left this country, while no reference to it appears in the Annual Report for 1906-1907, unless, possibly, in the statement that it lately had been ascertained that the tribes on the upper Waria were resident in British territory.'

"Last autumn Mr. Monckton allowed me to make a copy of his official report of the journey, and I have recently heard from him that he wrote to you from Madeira last November, giving some account of his experiences. As it is clear that you have not received this letter, and as Mr. Monckton has recently written to me concerning this letter and the Society, I now send you some extracts from Mr. Monckton's official journal. For it seems better to let you have this information while your article is still fresh than to wait the length of time necessary to communicate with Mr. Monckton and receive his answer."

"In a creek near the Waria is a curious outcrop of white rock, which Mr. Parkes—who has been an opal miner in Australia—told me was called by miners opaline, and occurs where opal is found in that country. . . . On the 4th I arrived at and camped near Emigi village on the Waria. December 5: . . . Travelled over a very high hill, and then along rough tracks all day. . . . I passed an island in a river on which, at one time, a village had been situated; but the village had been abandoned, and the suspension bridge which led to it cut. The waters of the river, which were very turbulent and rapid, were a deep, dark slate-colour."

"Apparently the climate of the Waria during the South-East season is very dry, for I noticed several clear 'burns' in the gardens, and the natives merely fell the bush and allow it to lie for a couple of months, and then fire the whole lot as it lies on the ground without any preliminary 'logging-up' or chopping process—a practice that I have not met with previously in New Guinea, where the clearing up of the ground after the trees have been cut down is the major part of the work. The country on both sides of the Waria river is here very rough and broken. . . . I noticed maize of not very good quality growing in the gardens, and excellent tobacco."

"December 6: Travelled over very rough country all day, and camped near Giguari village, after crossing nine bad creeks. . . . December 8 was spent in travelling over rough high hills, from which I obtained a view of Mount Albert Edward (south), and a big bare-topped mountain south-west, which . . . the natives called Gudimani. I came to the conclusion that I was about 10 miles in British territory. I could see from here that a branch of the Waria river heads under the column of Mount Albert Edward, and another from the north-west."

"December 9: Crossed the Waria by means of a high and particularly nasty suspension bridge. The bridge consisted of two cables of twisted vines, fastened together at a distance of about 3 feet by other vines. One walked on the bottom one and clung on to the top one; the bridge was about 50 feet high at one end, and 15 or 16 at the other, with a raging torrent underneath. . . . Camped in a village called Sisireta, where there was a large dance-house of neat construction; the village had been deserted for some time. December 10: The trails I followed led south-south-east and south-west, until, from a high spur, I obtained a bearing on the column of [Mount Albert Edward] of  $168^{\circ}$ . . . . Arrived at Beri during the afternoon to find that the villagers had deserted it, though a new club-house was in course of completion. . . . In the club-house there were a large number of long bamboo tubes, which the natives used instead of drums when dancing, producing a booming note by striking the end on the ground."

"The surrounding country was of poor soil, with grassy hills and stunted scrub, mainly a granite formation. . . . The Sisireta and Beri people are of poor physique; a large creek called the Wowo runs into the Waria some distance below the Sisireta crossing. December 11: . . . Travelled north of west over very bad hills all day, and camped at a small creek near a grass patch. . . . December 12: Crossed a branch of the Waria coming from the main range. . . . December 13: . . . Followed tracks running west-north-west on the side of the range through a maze of villages. . . . The natives in this part apparently do not smoke."

Mr. Monckton mentions bows, arrows of several types, and wooden clubs as the weapons of these natives.

These people "do not use spear pits or ground spears; they, however, set large timber 'figure of 4' traps for pig and wallaby, . . . also a heavy weight 'fall trap' for the same animals, sprung by a trigger and line. . . ."

After spending December 14 in crossing six low ranges of hills in heavy rain, Mr. Monckton arrived at Segasira village on December 15, near which a large creek

called the Korovi runs into the Waria. On the 16th a short march led to a big creek, the Ono, running from the north-west; on the 17th camp was shifted across the Ono creek to the bank of the Waria. . . . On December 19, being then camped at a height of 2636 feet, Mr. Monckton picked out his weakest carriers and sick and sent them back to a Tamata under escort. On December 20, moving across a fine grass tableland, Mr. Monckton passed several deserted villages and gardens. "All these villages are stockaded, and their vicinity was guarded by old spear pits. . . . Tobacco and sweet potatoes had been planted on some old graves, and a netted bag was suspended overhead." On December 21 Mr. Monckton marched all day over grass flats and low scrub-covered hills, reaching, on December 22, a large grassy spur, "on which was a . . . stone land or tribal boundary mark, and on which I cut a broad arrow. This was the extreme point visited by previous parties. . . . The Waria here divided, one branch heading from north-west, . . . and the other from south-west, through the main range.

"I estimated my position to be about on the edge of British territory and north-north-west from Mount Albert Edward. The main range runs in almost a straight line north-north-west from Mount Albert Edward." By this time only eight bags of rice remained, and it was accordingly necessary for the carriers to make sago. The right branch of the Waria was here of a "very dark lead colour," and this branch "lends its distinctive colour to the Waria all the way to the coast." On December 26, Sergeant Barigi, who had been sent out to the south-west to search for tracks, returned reporting a densely populated valley lying south of west, but he could not get into intercourse with the people. On December 27, Mr. Monckton travelled across the hills, "first by way of a small creek to south-west, and then up a spur to west," along the summit of which he journeyed south until he met with a native track running in this direction at about a height of 7000 feet, which was followed until it led to a grassy densely populated valley on the upper Waria. The old village in which camp was made "was built in a parallelogram within a square enclosure formed by a strong fence and a hedge, at one end of which was a fairly large well-built house, evidently once used for ceremonial or religious purposes. Each of the villages in sight was laid out in the same form, and each had the same isolated, fence-secluded building attached. The height of the village . . . was 5386 feet above sea-level. For the first time in New Guinea I found openings for windows in the houses, closed at night or during rain by curtains of native cloth. . . . In the ceremonial or clubhouse large stocks of new arrows were found; one arrow in each bundle was smeared with fresh blood."

On December 28 Mr. Monckton continued his march in a south-westerly direction, crossing a ravine on the far side of which several villages were situated. "A large stockade of green timber nearly 30 feet high had been built in the night across the track, in front of which a large space had been cleared. It appeared to me . . . that the stockade had been erected to prevent my party approaching the large ceremonial house. . . ." On reaching the top of a hill which it was necessary to ascend, Mr. Monckton came in sight of a large village. The natives "who came in were of the Semitic western type, wearing the broad bark abdominal bandage of the Gulf people. They had steel tools obtained from one of the German rivers to the north, with which they maintained trading relations. . . . They knew a few words of English taught to them by German natives at a place called Sipoma."

On the 29th Mr. Monckton travelled all day up a valley in a south-westerly direction, and "camped near a village, where more pigs and food were brought for sale. The natives pointed out nine sweet potato gardens full of pigs. . . . These people apparently make potato gardens solely for the purpose of feeding pigs in, as yams appear to be their staple diet." The natives at this point were a fine type of

people, but somewhat overbearing and truculent. They gave Mr. Monckton to understand that their steel tools came across the mountains from the south-west, and that flat country lay three days' journey in that direction, but that the people ahead were numerous and hostile to strangers.

On December 30 Mr. Monckton moved in a south-easterly and southerly direction, and, after some days passed in looking for a track, spent January 3 travelling 6 miles in a south-westerly direction, wading up the bed of an icy-cold creek, in which were many old stone fish weirs.

On January 4 the march was resumed in a southerly, south-easterly, and finally south-westerly direction, descending into a valley with streams flowing to the south-west, and so into a village surrounded by large gardens, situated on the extreme north-easterly affluent of the Lakekamu river, at a height of 2422 feet. "The houses here were of a totally different type to those on the Waria, being squat and oval-shaped instead of square and high. The village was surrounded by low fences, enclosed within which were scores of pigs, which camped at night under the living-houses." The villages here are not fortified or stockaded in any way, but the houses, like those of Waria, were rendered arrow-proof by thick bamboo walls. The women wear petticoats similar to those worn in the neighbourhood of Port Moresby.

On January 5 Mr. Monckton succeeded in making friends with these people, who use tobacco "in the form of cigars, which are smoked through a . . . holder made of a joint of bamboo about half an inch in diameter and 4 to 5 inches long. Maize, cucumbers of good quality, and a large bean are much grown and used by them." Near this village there was a suspension bridge over a stream built on the cantilever principle.

On January 6 Mr. Monckton recrossed the river and camped at a height of about 1500 feet.

January 7 was spent in crossing rough spurs. There was no defined track, and villages were now absent. Mr. Monckton notes, "The Lakekamu was now about the size of the Kumusi at the Yodda road crossing."

On January 8 the journey was continued along the bank of the river, the water of which was of a remarkably deep green colour. The river at this point was very rough and rapid. On January 9 the river began to show signs of being navigable for rafts.

On January 10 "the party travelled for three hours over flat swampy country, . . . and then camped to make sago and built rafts. The stream now ran about 2 knots, and was entirely free from snags."

On January 11 a start was made on the rafts at 8 a.m. For about an hour the river was descended in safety. The banks of the river became more swampy, "and the rate of the current increased until it was well over 4 miles an hour, but still clear of snags until we came to where the river forked, as I thought, the left-hand branch being followed by my raft. In obedience to a shout of warning from my raft, caused by snags being sighted, and the current becoming dangerously rapid, . . . about half the rear rafts took the right-hand branch to pass, as I thought, around the island. Suddenly a wall of timber appeared in front of us, the river meanwhile becoming almost a cataract and crowded with snags, and into the wall we dashed, my raft, which was only saved from capsizing by the magnificent pluck and nerve displayed by the police, being guided and pushed into the only quiet spot of water.

"Our shouts of warning were mainly drowned by the roar of the waters, but in any case no human power could prevent the rafts closely following me dashing into the wall, and one by one they did, precipitating, with one exception, their loads of men and gear into the torrent, some smashing and capsizing on snags before reaching the wall of logs and trees. Man after man crawled or was dragged from the

water and from the snags they were clinging to upon the log wall until apparently all were safe.

"After we had recovered a little from the effect of the capsizing, Lance Corporal Oia tried to make his way through the reeds and swamp to the other branch taken by Sergeant Barigi, only to return bringing a number of crocodiles' eggs, and to report that the swamp was impenetrable, infested with crocodiles, and the current in the stream too strong for us to make way against. . . .

"The whole river at this point spread out and flowed through a tremendous sago swamp, and how far that swamp was through we had no means of telling. The whole of the logs and swampy points we were then on showed signs of being submerged for a depth of 4 or 5 feet by the nightly floods due to rain, rendering our present unhappy position yet more insecure and dangerous.

"The first matter, however, was to recover our ammunition, then at the bottom of the river, a work of great difficulty and danger for the police, who had to dive and make fast cords to the handle of the box. While several of the police were engaged at this work, others and carriers were engaged cutting through the barrier of logs and recovering the material composing our rafts, as it was plain to me that the only hope of saving the men with me was to cut a way with the current, clean through the swamp on to the other side, as to retrace our steps or extricate ourselves in any other way was quite impossible. . . . After about an hour's heavy chopping, carriers and police relieving one another, and spurred to great exertion by the knowledge that if the river rose and caught us in our then position we must inevitably perish, the barrier was cut through and my raft started, cutting and forcing a way through the flooded forest, . . . the remaining rafts as they were repaired following in our track and sending men to help us in cutting or hauling and pushing the leading raft through or hauling it away from clumps of sago or trees against which the current would perpetually swirl in. Once a dead tree, whose fall was fortunately broken by a sago palm, fell right across the raft, and had to be cut into sections in order to release the craft.

"After a day of awful toil for the men, we emerged into a reed-surrounded lagoon with miles of swamps on every side, but where the rafts would float without danger of swirling currents. Here also the place was infested with crocodiles, and literally humming with mosquitoes. Here we tied the rafts up to reeds, while shots were fired and efforts made to collect as many of my party as possible before night, now fast closing in.

"Lance Corporal Oia flopped through the reeds and water to where a clump of bigger timber seemed to promise dry land, and at last yelled that he had found a place big enough to pitch camp on, with dry firewood, and there, after an awful struggle through the reeds and water, I went. Shortly after a raft appeared with Sergeant Barigi and two A.N.C. He stated that he had found the second branch of the river closed, and had then followed me, but meeting with a flying crowd of carriers headed by Private Daimaba, and being warned of the disaster I had met with, had abandoned his raft above the danger point and swum and crawled through the reeds until he had come to the channel cut by my raft up to some timber, where he had constructed a raft and followed."

The police and carriers were set to work making sago and building canoes and rafts, with the result that on January 15 the journey downstream was resumed. A big river "navigable for large launches, and perfectly safe for either canoes or rafts," was reached on the same day. The dangers of the journey were now over, and two days later Mr. Monckton reached McGowan's plantation on the Lakekamu, thus completing the crossing of New Guinea by a new and most adventurous route.

## GEOGRAPHY AT THE BRITISH ASSOCIATION.

THE British Association met this year at Dublin, on September 2-9, and the work of the sections began on Thursday, September 3. To the meetings of Section E (Geography) the theatre of the Royal Dublin Society, in the fine buildings in Kildare Street, had been allocated—an admirable chamber acoustically, and excellently equipped for the purpose of exhibiting lantern-slides. The President of the section was Major E. H. Hills, C.M.G., R.E.; and the other officers and sectional committee, as finally constituted, were as follows:—*Vice-Presidents*: Rev. W. Spotswood Green, C.B., M.A.; Captain H. G. Lyons, R.E., D.Sc., F.R.S.; Major Leonard Darwin, R.E.; Major C. F. Close, R.E., C.M.G.; J. Bolton; Dr. A. J. Herbertson; Prof. W. M. Davis. *Secretaries*: O. J. R. Howarth, M.A. (Recorder); W. J. Barton, B.A.; E. A. Reeves; W. F. Bailey, C.B. *Committee*: Staff-Commander E. Dubois-Phillips; Captain H. L. Crosthwait, R.E.; J. Howard Reed; Dr. H. O. Forbes; Major W. L. Forbes; H. O. Beckett; Dr. H. R. Mill; Prof. J. L. Myres; Prof. R. A. Gregory; J. Macfarlane; H. G. Fordham; W. L. Grant; Dr. W. S. Bruce. Mr. G. G. Chisholm, on leaving the meeting early, vacated the position of vice-President, and Mr. J. G. Bartholomew was prevented from attending and filling the same office.

The President took the survey of the British Empire as the subject of his address to the section (reported in full elsewhere in the *Journal*). Major Leonard Darwin, in proposing a vote of thanks for the address, touched upon the possibility that if a further war occurred in South Africa, the lack of maps would be felt in some measure as it had been felt before. He said that two schools of thought existed with regard to the mapping of British dominions; according to one, maps, even if indifferent, should be made at once where they did not exist; according to the other, maps were useless unless based on a thorough and careful survey. He thought this controversy would be settled if the government undertook the work on proper lines. Sir David Gill, seconding the vote, strongly urged the same point of view, and also supported the President in his recommendation that the two principal arcs in Great Britain should be remeasured. It may be added here that this latter recommendation was subsequently embodied as a resolution of the sectional committee, inviting the Council of the Association to suggest to the Board of Agriculture and Fisheries that the Director of the Ordnance Survey should undertake the work as part of the current work of his department. In connection with the lack of maps of certain British dominions, Major Darwin stated at the meeting on Friday, September 4, that he did not wish his remarks on the previous day to be taken as reflecting on the excellent work carried out by the Colonial Office in the direction of surveying, and Major Hills supported this attitude from the chair.

Prof. W. M. Davis followed the presidential address on Thursday with a paper on "The Physiographic Subdivisions of the Appalachian Mountain System, and their Effects upon Settlement and History." He pointed out that the system may be divided into the crystalline longitudinal belt on the south-east, and the stratified longitudinal belt on the north-west, with the Appalachian plateau to the north-west again. The crystalline belt is low, narrow, and interrupted in a middle section; it is higher and broader in the north-east and in the south-west. The stratified belt is most characteristically developed in a middle section, where alternations of resistant and weak strata result in alternations of ridges and valleys; in the north-east the ridge-making strata are absent; in the south-west they are of less strength than in the middle section. The plateau belt continues in full

strength along the greater part of the stratified belt in the United States, but it terminates in Eastern New York. Farther north it may be said to be replaced by the Adirondack mountains, separated from the plateau by the Mohawk valley. The lecturer pointed out the manner in which these various physical structures had offered routes or opposed barriers to the progress of settlement.

In the afternoon the Rev. W. Spotswood Green attracted a large audience to his lecture entitled, "Ireland: her Coasts and Rivers." Taking the theme that geographical and social conditions are so closely bound together that they may almost be regarded as aspects of a single problem, the lecturer first illustrated various typical aspects of Irish scenery (mainly coastal) by means of admirable lantern-slides, and then appended appropriate remarks on the physical history and early social history of the country. The especial interest which he had in view was that of those visitors to the association meeting who intended to extend their knowledge of Ireland beyond the immediate neighbourhood of the capital, and from this point of view the lecture was evidently appreciated in full.

The greater part of Friday morning (September 4) was devoted to education. Prof. R. A. Gregory, in his paper on "School Geography as a Mental Discipline," said that though there are many sciences there is only one scientific method, consisting in the collection and arrangement of facts with the view of discovering relationships and arriving at correct conclusions. The teaching of geography is slowly coming into line with this method, and it is being recognized that the scientific aspect of geography should be a matter of personal observation rather than of description. Suitable exercises should be devised, on maps beginning with the district known to the pupil, and passing thence to other larger areas. Geography should not be taught as information to be remembered merely; numbers and symbols should not be set before pupils without explanation of their meaning and bearing. Pupils should rather be brought face to face with evidence and trained to study it for themselves. Along with opportunities for personal inquiry, descriptive lessons or reading should be set so as to encourage interest in the earth and its inhabitants. In the discussion which followed, Dr. A. J. Herbertson said that if it was found impossible to arrange practical work, the school curriculum must be at fault. Deductive, as well as inductive, methods must be taught. For the purpose of local field work and teaching by personal observation, Ordnance survey maps, he pointed out, could be obtained by teachers at nominal prices. Mr. H. G. Fordham advocated instruction in the growth of geographical knowledge by means of the comparison of early engraved maps with modern maps. Major W. L. Forbes, in answer to comments on the difficulty of obtaining proper geographical qualifications in teachers, said that chairs of geography must be established in all universities, and teachers must be properly trained, before really good work can be done in the schools.

Prof. J. L. Myres then gave a paper on "The Geographical Study of Mediterranean Man, considered as an element in a 'Classical Education.'" He had found that the knowledge obtained by university students of the history and social conditions of the Greek and Roman world is obtained without regard for accompanying geographical conditions. Correlation of the study of geography with classical (and other) studies is ignored. Yet geographical study, at an early stage in the classical course, would familiarize students with the background on which to draw in the historical and social picture. But teachers of classics were not generally, at present, equipped to give appropriate geographical training. After this paper the Rev. T. Corcoran, S.J., made the interesting point that German classical cartographers had apparently studied Roman history to the exclusion of Greek, and that their maps showed a regrettable partiality towards the illustration of the former.

Following these papers Dr. W. S. Bruce showed some fine lantern-slides, which were greatly appreciated, of views taken on the *Scotia* Antarctic expedition, and in his accompanying remarks referred to the scientific results of that expedition, now in course of publication. A magnetic observatory was established at Scotia bay in the South Orkney islands, and named Copeland observatory after the late Prof. Ralph Copeland. Here Mr. R. C. Mossman carried out observations during the wintering of the *Scotia*, and during her absence at Buenos Aires. Captain Thomas Robertson made tidal observations every half-hour at Scotia bay, and these showed a remarkable normality. Mr. Mossman's meteorological observations have especial value since the Argentine Government undertook to carry on the observations at Scotia bay, and have now five years' continuous records there. The line between easterly and westerly systems of weather is found to be about  $65^{\circ}$  S. in the Weddell and Biscoe seas. The observations in ocean physics are now in process of working out. By bathymetrical observations the expedition has showed the Ross deep to be non-existent; a depth of 2660 fathoms was found, for example, where Ross reported 4000 fathoms. "Rises," with less than 2000 fathoms depth, connect Graham's land, the South Orkneys, and the Sandwich group, as well as the south of South America and Antarctica, and south of Gough island a continuance of the mid-Atlantic rise 1000 miles to the south was sounded. Topographical work included a detailed survey of Laurie island in the South Orkneys, and a running coast survey of the north side of Coronation island, and of 150 miles of the new coast-line discovered by the expedition and named Coats Land. Biological collections were made both from the surface of the sea and from great depths. The results of these observations tend to destroy the value of the theory of bipolarity. The meteorological, deep sea deposit, bathymetrical, and biological observations all go to indicate the existence of continental land not far to the south and west of the South Orkneys.

In the afternoon, Mr. W. L. Grant, assistant to the Reader in Colonial History at Oxford, gave an illustrated lecture on "The Northward Expansion of Canada," introductory to the visit of the Association to Winnipeg in 1909. He showed that at the federation Canada "was length without breadth." He compared it now (that is to say, its present developed area) to the form of a wasp with its waist at Winnipeg. The progress of the country had depended on the spread of knowledge as to geographical conditions (for the ignorance as to these was even until lately profound), to the growth of confidence, and to the conquest of such conditions as were unfavourable. He brought out the noteworthy point that railway construction proceeded in advance, not in the rear, of settlement.

The Saturday (September 5) was as usual devoted to excursions.

On Monday morning (September 7) Mr. E. A. Reeves exhibited and described three instruments recently designed by him for the use of travellers and surveyors—(1) The distance-finder alidade for plane-tableing; (2) The astronomical compass and time indicator; (3) a new form of reflecting artificial horizon. Mr. H. G. Fordham followed with a paper entitled "Notes on the Cartography of the Counties of England and Wales." He summarized the results of his inquiries into the history, bibliography and characteristics of the engraved maps of the counties. He indicated the position of the Dutch, Flemish, and French schools of geographers in relation to the contemporaneous work in England at different periods, and established a classification by reference to the initial meridian lines adopted, and to the style and art developed by engravers in this department. He also noticed the principal authors and their best-known works in chronological order, and mentioned, by way of illustration, that in all about 400 maps have been published of the county of Hertford, of which, however, more than one-half are reprints, more or less

altered from the original plates, and may be regarded as duplicates. A complete collection for any other country would contain approximately the same number. The large number of original maps which he exhibited to illustrate his remarks were examined with great interest.

In the afternoon Captain H. G. Lyons (who, it may be mentioned, received an honorary degree of Trinity College, Dublin, during the meeting) read a paper entitled "The Longitudinal Section of the River Nile." He said that in the course of the survey of the upper Nile region work had been done which, *inter alia*, almost completed a line of levelling from the Mediterranean to Victoria Nyanza, a distance of 3500 miles. The equatorial plateau consists of great crustal blocks, the level surfaces of which are occupied by such lakes as Victoria, Choga, Albert Edward, and Albert. From the foot of the plateau stretches the level plain of the Sudan, where the rivers (Bahr el Jebel, Zaraf, and others) have a very slight slope—little more than 8 inches per mile. The flattest part of the course of the Nile is between the Sobat and Khartum, where the slope varies from half an inch to one-third of an inch per mile. Below Khartum the character of the river-bed changes; reaches of rapids where the river is eroding the crystalline rocks alternate with reaches of lower slope where the rock is sandstone. These crystalline rocks therefore form natural obstructions which can easily be converted into dams for storing up water in the valley above. In these rapids the slope is at times steep, but never for any considerable distance, and the mean inclination rarely exceeds 1 in 1000 for any length of river. At no point can the river be said to descend a vertical fall; the cataracts are, in fact, reaches in which the river has cut its way down to portions of the ancient and uneven land surface formed of the crystalline rocks on which the sandstones of Cretaceous age have been laid down. The position of the ridges of this ancient land has determined the places where cataracts occur, but the water-channels in them follow the lines of weakness due to bands of softer rock or to lines of fracture caused by the movement of the crust during long ages. The last of these barriers is at Aswan, and below this the river flows in the wide alluvial plains which it has formed by deposition, and is building up at the rate of about 4 inches per century. The equatorial plateau and the region of the cataracts are regions in which the river is eroding at the present time, while in the Sudan plains and in Egypt deposition is taking place.

The meeting on Tuesday morning (September 9) opened with a short paper by Mr. L. C. Bernacchi on his journey into the region of the Rio Inambari in Peru, where in 1907 a preliminary survey was carried out in practically unexplored country at the expense of an English rubber company. On the steep eastern slope of the Andes Mr. Bernacchi noted a remarkable variety in succession of temperature, scenery, and vegetation. The forests are rich in fine Para rubber trees, and the working of these and other forest products is gradually opening up the district. The inhabitants are mainly Quichua, but of greater interest are the Atsahuaca, a people of excellent disposition, who are monogamists, and live by hunting. They are nomads, and are nearly extinct in the Inambari district.

The Rev. George Furlong lectured to a very large audience on his remarkable experiences at the birth of the volcano of O Le Mauga Mu in Savail, Samoa, where he was a missionary. After a period of earth unrest, two fissures opened on August 4, flame-coloured steam and vapour broke forth with heavy explosions, and masses of debris were ejected, and soon began to build up the crater. Streams of lava carrying other matter rolled from the vent; their rate of progress was calculated at half a mile in twenty-four hours. The behaviour of these lava-streams was carefully watched by Mr. Furlong. He observed that the surface of the lava quickly solidified, and thus a tunnel was formed through which the flow went on, so that

between the crater and the vast columns of steam where the lava reached the sea it was difficult to realize that volcanic action was in process. He believed that the volcano was more active during the period of full moon than of waning moon; also, that the fumes from the volcano were not always of the same nature. Several tidal waves were experienced, always in the same place; they were about 500 yards wide, and flowed inland about 100 to 120 yards. These waves were observed to occur when the crater was more than usually active. Mr. Furlong's remarkable lantern slides showing the volcano in action were received with high appreciation.

Dr. W. S. Bruce then gave a lecture, illustrated with lantern slides, on his work in Prince Charles Foreland, off Spitsbergen. A committee of the Section, of which he was secretary, reported to the present meeting on this work, and Dr. Bruce now amplified the report by describing his methods of work and his experiences.\*

The afternoon was devoted to a subject of local interest—the exploration of certain of the extensive caverns which occur in the Irish limestone, by Mr. Harold Brodrick and Dr. C. A. Hill. Mr. Brodrick describes his experiences, and gave the results of his careful surveys and observations in the Marble Arch caves in county Fermanagh, a full account of which, with complete measurements, was promised for publication in the *Irish Naturalist*. Dr. Hill gave a similar description of the well-known Mitchelstown cave in county Tipperary, in the Blackwater valley. He showed that there are actually two separate and distinct caves. The existence of one, the "old" cave, is now forgotten, though this cave was known and exhibited in 1777. The "new" cave, first discovered in 1833, is now the only one shown to visitors. Very little is known of the full extent of the caves even at the present day, and no reliable plan or map exists. Dr. Hill, visiting the cave in 1905, took many photographs, of which he now showed lantern slides, and also explored portions till then unvisited. The cave was found to be of much greater extent and complexity than was previously imagined. Geologically the "new" cave is of great antiquity, as evinced by the enormous size and number of the stalactite and stalagmite formations. There is no evidence of present active water-action, the cave being practically dry, except at two points, erroneously called "the River." The explored passages are estimated at  $1\frac{1}{2}$  mile in length.

These papers brought a successful meeting to a close. Of the reports of the committees of the section, reference has already been made to that associated with Dr. Bruce's work in Spitsbergen. That of the Committee for Investigations in the Indian Ocean, of which Sir John Murray is chairman and Mr. J. Stanley Gardiner secretary, showed that work is in active progress. The same applies to the Committee on Rainfall and Run-off, which, however, did not present a report. Mr. R. T. Günther reported that, although he hoped to revisit Italy before publishing the results of the Investigation of the Oscillation of the Level of the Land in the Mediterranean Basin, the object for which this committee was appointed is accomplished.

Among papers read before other sections, allusion on the score of geographical interest should be made to that on the Veddas of Ceylon, by Dr. C. G. Seligmann, read before Section H (Anthropology). He showed that at the present day the Veddas fall into groups characterized by different sociological features. The coast Veddas have borrowed largely from their Tamil neighbours, while the village Veddas have, to a considerable extent, intermarried with the Sinhalese. Nevertheless, both groups retain the remains of their old clan organization in the majority of their settlements, showing their connection with those less contaminated and wilder folk who have commonly been spoken of as "rock" or "jungle" Veddas.

\* See paper by Dr. Bruce in the *Geographical Journal* for August, 1908.

On the psychical side, the life of all Veddas is unusually limited in every aspect except one, namely, their regard for the dead, and even this regard, which attains the intensity of a cult, has given rise to no decorative art. But it has given rise to a series of dances, usually accompanied by offerings of food to the spirits of the departed. Though others take part in them, these dances are performed especially by men who have been trained to invoke the *yaku*, as the spirits of the dead are called, and the use of a ceremonial arrow with a blade over a foot long and a short handle is an indispensable feature of some of these ceremonies, in all of which the "shaman" becomes possessed by one or more of the *yaku* he invokes. All Veddas speak Sinhalese, or dialect of Sinhalese, but in addition many Veddas have also a small number of words which are not obviously Sinhalese, or are Sinhalese periphrases. These classes of words are specially used in hunting and in addressing the *yaku*.

The presidential address, by Prof. Ridgeway, to the Anthropological Section, contained an interesting discussion on the subject of environment and race, which was published in the October number of the *Journal*.

## THE SOUTHERN KALAHARI.

THERE has recently been presented to the Cape Parliament an interesting report on the Rietfontein area of Bechuanaland, which, though principally composed of the Vilander territory, also includes a slice of the Southern Kalahari. The report has been drawn up by Mr. J. F. Herbst, the assistant resident magistrate, and is based on four years' experience of the country, only a very small part of which has been surveyed.

Describing the physical characteristics, Mr. Herbst distinguishes two main features; the one, a region of hard stony veldt, consisting of plains and flat-topped ridges at wide intervals; the other, an immense undulating expanse of sand, covered with grass. The red sand-dunes can be seen impinging in long irregular lines like tongues of flame on the hard veldt region, but they do not seem to have extended their encroachments within the memory of any one living. The dunes run for the most part in parallel lines east and west, and the intervening valleys (called "straats," the Dutch for "streets") range from 100 yards to 2 or 3 miles in width. Dotted about in the sand are found extensive basins, known as "pans," usually from about 100 yards to a mile in diameter, with beds as level as a billiard table. In some, white lime predominates, while others have a surface of reddish-brown loam. After rains they are covered with a few inches of water, which generally becomes brackish after a few days. At Haakscheen there is a specially large pan, formed by the storm waters of the hard veldt region being dammed by the sand dunes. When full it comprises a sheet of water 16 miles in length by 6 in width, and attracts large numbers of water-fowl, but it retains water only for about three or four months in the year. There are also two large salt-pans within the area, one of which is capable of an output of thousands of bags yearly. Towards the basin of the Molopo river flats of sand occur, with peculiar flat rocks of limestone a few inches underneath. Here there are large depressions with abrupt walls, resembling artificial excavations, which Mr. Herbst thinks were clearly at one time lake-beds, though now perfectly dry.

The general slope of the land is in a southerly direction, with a depression down the middle, where lies the bed of the Molopo river after being joined by the Nosop — with its tributary the Ouap — out of German territory, and by the Kuruman

river from the east. All these are perennial streams in their countries of origin, but Mr. Herbst states that in the Rietfontein area only the Kuruman has been seen to flow within the memory of living man, and that was in 1894. Judging by their size, he thinks there is no doubt that the river-beds formerly carried considerable streams of water. They are still bordered on either side by thick belts of acacia and other trees, sometimes as much as 2 miles broad. Mr. Herbst also infers that the river-beds have been raised considerably, since in the wells that have been sunk in their courses, white shingle, beautifully smooth and rounded by running water in times past, is found 50 feet below the present surface. Below this shingle the water is found.

The climate is described as equable on the whole, but subject to occasional rapid changes. Mr. Herbst has seen the thermometer drop in summer from 110° in the shade to 60° in the course of six hours, while a temperature of 50° at 2 p.m. in mid-winter has risen to 90° in twenty-four hours. During the summer of 1906-7, in the five months November to March, there were sixty-six days on which the temperature rose to over 100°, the monthly average of the daily shade readings at 2 p.m. ranging between 94° and 98°. In the five winter months, May to September of last year, the monthly average of the daily readings ranged between 64°-8 and 73°. That, however, was an unusually warm winter, with frost on only two occasions. Usually there is a good deal of severe weather in July and August. Except during June and July, scarcely a day passes without wind from one direction or the other, often in force from every point of the compass within a few hours. The rainy season extends from December to March, and is fairly regular year by year; but in the summer of 1896-7 there was no rain, and up to the date of Mr. Herbst's report in the middle of February this year there had been no rain in the summer of 1907-8. The average rainfall Mr. Herbst places at from 7 to 9 inches.

In these circumstances, what Mr. Herbst describes as the wonder of the Kalahari is its profuse vegetation. After the summer rains the various grasses grow to a height of 2 or 3 feet, giving the country the appearance of a vast cornfield, and so thick is the undergrowth that one can hardly realize it hides the dreaded desert sand. Specially important in the economy of the desert is the "tsamma," a plant belonging to the gourd family, and resembling the ordinary water-melon plant, save that its leaves are slenderer and smaller. There are two species, one tasteless and the other markedly bitter, between which the Bushman can readily distinguish at sight, though the inexperienced have to judge by taste. The plant has a very destructive effect on steel, blunting the sharpest knife after a few minutes' use, and the Bushmen cut it with home-made bone knives. It bears in great profusion. Mr. Herbst has counted over a hundred melons on one stalk, and during a good season it is unsafe to gallop a horse through the "straate," so thickly do the melons lie on the ground. The first frost kills all the leaves and stalks. The fruit remains wholesome for about twelve months after maturity; then it dries, and the seeds are ready to grow with the first rains of the following summer, so that it reproduces itself only every other summer. A good "tsamma" season is always followed by a poor one, and *vice versâ*. In its raw state the fruit is chiefly remarkable for its thirst-quenching properties, but as food it fattens cattle with remarkable rapidity, and when cooked also serves as a food for man. Other members of the gourd family indigenous to the Kalahari are the spinous wild cucumber and the gemsbok cucumber, while, as a result of the summer rains, enormous quantities are found during the winter of what the Bushman calls "Nabba" and the Dutch farmer the Kalahari potato, but which Mr. Herbst says is nothing more nor less than the European truffle. The varied grasses of the Kalahari also serve a valuable purpose

as a food for grazing animals, the most notable varieties being the two kinds of Bushman grass, the "Langbeek," a tall, sweet grass, and the "Fijn Twoa," a more delicate and richer grass. On some of the farms on the outskirts of the Kalahari the Australian Salt bush has been cultivated with some success on the edges of the pans, but in the Kalahari itself the soil is so fresh that the bush loses its saline properties.

Formerly, the Rietfontein area was the habitat of almost every species of the larger fauna, but the numbers have been greatly reduced by the joint attacks of Bastards and Bushmen. In the last few years protective laws have somewhat checked the slaughter, and Mr. Herbst notes that the animals are returning to some extent to their old haunts, gemsbok and ostriches in particular having increased considerably. The Bushmen, instigated by the whites and Bastards, still levy heavy toll upon the game in the recesses of the desert, and considerable quantities of hides and feathers exchange hands; but the greatest destruction is wrought by the wild dogs, which hunt in large packs, and not only kill but wound in a wholesale manner, for they will not touch dead meat, but eat it from the living animal, whom they gash in a shocking manner as they race alongside.

Mr. Herbst gives an interesting account of the occupation of the Rietfontein area by the Vilander group of Bastards, who first moved in about the year 1865, and who, in turn, have been largely ousted by whites. Bushmen now exist in the country only in isolated groups. When the Bastards arrived they found, Mr. Herbst states, two tribes of Bushmen, the one a diminutive yellow race called "Gommanes"—probably fugitives from Cape Colony—the other a darker and taller race living on the Nosop river, among the Bechuana, from whom they doubtless inherited their swarthy complexion. The yellow race is almost extinct, but a mixture is still found in the Kalahari.

Practically the only industry is stock-raising, which has been successfully carried on since the country was first occupied by the Bastards. Cattle, horses, Afrikaner sheep, and the common Boer goat were then introduced, and the sheep and goats in particular multiply with remarkable rapidity. Except in the low-lying valley of the Molopo river, stock disease is practically non-existent. The permanently habitable portions of the country, however, have now been fully taken up, and hold as much stock as they can carry. For the future settler there is only the waterless Kalahari. If the summer rains could be relied on regularly, a permanent water supply could be dispensed with, as the "tsamma" would be sufficient for all needs. Even under present conditions numbers of Bushmen and stock exist in the desert for many seasons without water, except just after rain. With a permanent water supply stock-farming could be conducted on a large scale; but no proper attempts have yet been made to find water in the Kalahari. Mr. Herbst suggests that, as in other limestone regions, there may be underground rivers. He thinks it almost safe to say that no good water will be found at the depths at which ordinary wells are sunk, and, to his mind, the solution of the problem, if solution there be, lies in artesian wells. Experiments of that nature can only be undertaken by the Government, but Mr. Herbst is so persuaded of the great potential resources of the country that he urges every effort should be made to discover whether water cannot be found.

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## REVIEWS.

## ASIA.

## ASIATIC TRAVELS.

'Selections from Travels and Journals in the Bombay Secretariat.' Edited by G. W. Forrest, C.I.E. Bombay: 1906.

This volume contains a variety of journals, letters, and records of travel brought together and published by Mr. Forrest, ex-director of records at Bombay. From a geographical point of view they are no doubt interesting, but the editing is hardly so satisfactory as it might have been. As to whether these papers had been published before, the editor gives little definite information in his "Introduction." One of the more voluminous papers is a series of letters by C. Masson, the American orientalist, who travelled in Afghanistan some seventy years ago. We have made a cursory examination of these letters side by side with Masson's well-known work, and the letters in Mr. Forrest's book appear to be identical in many respects, but there are improvements in the choice of phrases, descriptions, and so on in Masson's book, which lead one to think that the manuscript now reprinted may have been a sort of rough draft of the published work. Some of the names have been seriously mutilated. The village of Morad Ali is printed as Morally, and the well-known place Kohat appears throughout as Kivort. Moreover, the extracts would seem to have become mixed in some instances, so that they are not printed in their proper geographical and chronological places. There is no reference in the Introduction to Masson's letters, which occupy more space than almost any other contribution. The first paper in point of order is a translation of a French officer's itinerary from Yezd to Herat, and thence to Kabul in 1826. The well-known General Avitabile was a fellow-traveller of the French officer. The next is a report by Major D'Arcy Todd (who accompanied Mr. John McNeill, on his mission from Teheran to Herat) on a sixty days' journey from Herat to Simla in May to July, 1838. The route covers much of the same ground as that followed by the French officer referred to above. Then follows a short note on Herat and surrounding countries by Alexander Burnes. A narrative of a journey from Khelat to Sonmiani in November, 1839, from the pen of Captain J. Outram, follows, and this is succeeded by an account, in two parts, of an embassy to the King of Persia from the Amir of Kabul, written by Mahomed Hoosani Kashee, the Elchi, at the request of Captain Burnes. Several letters from Major D'Arcy Todd, dated in the early part of 1841, deal with the breaking off of our relations with Herat, and there are followed by some of Lieut. Pottinger's letters from Herat of somewhat older date, *i.e.* March, 1838.

We then pass on to Arabia. A report dated 1835 by Lieut. Wellsted, I.N., whose name may be recalled in connection with some notable marine-surveying work in the old *Palinurus*, contains a description of the ruins of Nakab-al-Hajar in the Wadi Meifah in Southern Arabia. The conclusion of Lieut. Wellsted was that the ruins were magazines and forts erected during the Sabeian dynasty two thousand years ago, when the trade from India flowed through Arabia towards Egypt. There is also a short account of an excursion in Hadramaut by Baron Adolf Wrede, and a Memoir by Captain Haines, I.N., of the *Palinurus*, concerning his survey of part of the South Arabian coast from the entrance of the Red sea to Misenat. A rather longer paper by Mr. Charles Cruttenden, also of the Indian navy, furnishes a narrative of a journey from Mokha on the Red sea to Saná in Yemen in July and August, 1836. Most of these Arabian papers were originally

printed in the *Journal* of the Royal Geographical Society. The last paper in the volume is a lengthy record of a journey in 1841 to Shoa, in Southern Abyssinia, carried out under the command of Captain W. C. Harris of the Bombay engineers, who undertook the mission to the King of Shoa under the instructions of the Bombay Government. The narrative is apparently from the pen of Lieut. W. C. Barker of the Indian Navy. The Introduction prefixed to the volume contains a good many interesting details, but might advantageously have been compressed, the long extracts reprinted from the papers themselves being unnecessary.

C. E. D. B.

#### BORNEO.

'Quer durch Borneo: Ergebnisse seiner Reisen in den Jahren 1894, 1896-97 und 1898-1900.' Von Dr. A. W. Nieuwenhuis unter Mitarbeit von Dr. M. Nieuwenhuis, von Üxküll-Güldenbrandt. Zweiter Teil, mit 73 Tafeln in Lichtdruck und 18 Tafeln in Farbendruck. Leiden: E. J. Brill. 1907. Pp. i.-xiii., 1-557. Price 19s.

An apology is due for delay in noticing the second volume of the valuable monograph by Dr. A. W. Nieuwenhuis on the ethnography of the interior of Netherlands Borneo, which delay, however, is not due to any lack of appreciation. In bringing his labours to a conclusion the author has presented us with the best original contribution to a knowledge of the ethnography of the fascinating people who dwell in the interior of Borneo. In another publication the indigenous population is divided into (1) the nomadic hunters, Punans, Beketans, Bukits; (2) the Bahau-Kenya-Kayan group in the north and east; (3) the Ulu Ayar or Ot Danum in the south. The jungle hunters are a fairly uniform, low brachycephalic group, the cephalic index in the living varying from 77-86, with an average of 82; they may very well be regarded as representatives of the original inhabitants. The Ulu Ayar are essentially dolichocephalic, with a preponderance of indices at 74 in the living, but ranging from 71 to 81. Their skin is darker than that of the other peoples, and Dr. Nieuwenhuis states that he sees no reason why they should not be of Indonesian stock. The Muruts of Sarawak are evidently an allied people. Of the third group only Kayans were measured; their head indices varied from 68 to 97, with maxima at 78 and 80; they are thus a mixed race. A summary of recent measurements of the interior peoples of Borneo will be found in *Man*, 1905, No. 13. In his first volume, the author (cf. *Geographical Journal*, vol. 25, February, 1905, p. 202) dealt more particularly with the Kayans, but made interesting comparisons, especially in their decorative art and tattooing, with other tribes. The district of the middle Mahakam (i.e. between the western waterfalls and Udju Tepu, including the eastern falls) is inhabited by numerous small groups, almost all of which remember their migration from the high-lying home of their race, Apu (highlands) Kajan (Kayan), whence they were ejected by the increasing pressure of the population. They all occupy the main river, though a few have settled on the tributaries, the sources of which are visited by the Punans. These Bahau-Kenya peoples have formed the inhabitants of the Mahakam district for centuries, the latest arrivals from Apu Kajan being the Long-Glat, at the end of the eighteenth century. This tribe has met the fate of all who have wandered into the lowlands from the highlands, suffering more than in their isolated mountain country from malaria and infectious diseases, such as cholera, small-pox, etc., contracted from the coast, losing in numbers and health, and the process of degeneration is already far advanced among the many groups on the middle Mahakam. While the dwellers in the mountains seldom suffer hunger, thanks to their industry, it is a frequent visitor in the lower regions, and much foreign rice has to be imported. The presence of foreigners in this district also contributes to degeneration. The Bugi and Kutei

pressed in from the lower Mahakam after the bush products were exhausted to exploit the untouched forests of the middle Mahakam. This incursion of outsiders first occurred after the Bahau chiefs had come more and more under the influence of the Kutei Sultanate, and the traders found more protection. But the Bahau of the upper Mahakam have found a natural protection in the rapids and waterfalls against the influence of the coast Malays, who trade with the middle Mahakam, while dwellers on the latter seek the markets of the coast. Their original manners and customs suffer less from the contact than their health and welfare, which is frequently affected by the worse climate and hygienic conditions, and also by gaming, cock-fighting, and betting. For example, bark cloth is almost entirely discarded, being superseded even in mourning by white or light brown cottons. The families of chiefs who have adopted Islam dress in Malay fashion, and even the chiefs who remain heathen, find Malay fashions more suitable to their rank than native costume. As for their agriculture, which is the main occupation of the inhabitants, very little primeval forest is felled, the Bahau contenting themselves, like the Malays, with cutting down under-brush and young trees, because the work is easier. Later, however, the weeding in these fields takes more time and trouble than was originally saved. The gulf fixed between the free men and slaves is very clearly marked, and inter-marriage firmly discouraged. The slaves are well treated, and neither sold nor put to death, but few attain to positions of influence; and none may possess any land save a small piece next to the chief's fields, which is necessary for their sustenance. The gulf between the chief and the free men is necessarily bridged over by the exigencies of polygyny. The polygyny of the chiefs is attributed to Malay influence, as it was not customary in early times. Another modern custom is the betrothal of young girls almost as soon as they are born; this results in premature marriage and child-mothers. Among the Bahau of the Mendalam the women play an important part, are consulted in all affairs, and in many respects enjoy greater privileges than the men; but in the Makalam they have a subordinate position, and are not consulted by the men. The superiority of the position of the former is doubtless due to the fact that the men undertake very long trading journeys. Serious quarrels do not occur among the Bahau; the compounding of offences by law-breakers or enemies, even the expiation of murder itself, is preferably by fine. Human sacrifice is due to religious conviction and love for the dead. They are under-developed and cowardly rather than revengeful, bloodthirsty, and brave. Their expression for fearless courage is characteristic; they call it "stupid courage." Truth is disregarded; they are shameless and inveterate beggars, but not thieves. The ties between parents and children are very close and tender, the children being generally spoilt and often tyrannical. Only the souls of those who have met a sudden death are feared. The fact that Borneo, especially Central Borneo, is so thinly populated has been attributed to various causes, such as internal warfare, wandering habits, etc.; but these cannot apply to the Bahau or the Kenya, where all conditions of life seem favourable. But the people are too ignorant to take advantage of the favourable or to avoid the unfavourable conditions, and they fall victims to various diseases against which they have no remedy save charms. Diseases such as malaria and small-pox (which has been known to carry off one-third of the whole population of a settlement) are not only fatal in decimating the population, but also in enervating the remainder, and to this the backwardness and ignorance are probably due. The methods of agriculture and of hunting are primitive, arduous, and unprofitable, and fear of punishment by spirits hinders all innovation and experiment. At the same time the Bahau show good mental ability; many can speak several dialects, and learn them without apparent difficulty. They exhibit considerable mechanical skill and a

most admirable artistic feeling and dexterity. The daily life, technology, and art-work of the Bahau are fully described and most abundantly and beautifully illustrated.

A. C. HADDON.

#### CERAM.

'Het Eiland Seran en sijne Bewoners.' Door F. J. P. Sachse, Kapt. der Inf<sup>o</sup>, o.i.l. Boekhandel en Drukkerij v/h E. J. Brill, Leiden. 1907. Pp. 184. *Prijs* Fl.3.50.

The island Ceram, as it is generally though incorrectly spelt, has not hitherto been thoroughly explored, for the interior consists, especially in the west, of mountainous country clothed with dense forests and peopled by savages who are by no means well disposed towards Europeans. Being civil commissioner in the island during four years when the Government decided to negotiate directly with the natives of the interior, Captain Sachse had unusual opportunities of making acquaintance with the remote parts of the island and its inhabitants. In a short sketch of the geography, the author reports that the central chain does not run the whole length of the island, as has been stated, but only from the Gunung Dibaban to the Hatu Walokoné group. The Wallace mountains are a separate group, connected by a rather flat undulation with the spurs of the Hatu Walokoné. The highest summit is the Merkélé, about 6200 feet, though on some maps it appears as the G. Mansela with a height of 6500 feet and more. The inhabitants, to whom a large part of the work is devoted, are Alfurs, but on the coast mixed with strangers—Javanese, Makassarese, and Malays. Probably Van Hoëvell's estimate of their number, 63,487, is nearest the truth. The Alfurs of West Ceram are well built and of a fairly tall stature, while those in the middle of the island are smaller, averaging nearly 5 feet. Most of them have no religious beliefs, but a kind of ancestor worship prevails among a few tribes. The most distinctive ceremony is the initiation into the Kakihan brotherhood, of which Captain Sachse gives no explanation, but states that at the present time, at any rate, it has no political signification. Perhaps it merely marks the attainment of manhood, which seems to be further indicated by the duty imposed on the youths after the ceremony of going head-hunting. In many respects the Alfurs of the interior are superior to those on the coast, and many other natives of the eastern archipelago. Their great vice is drunkenness.

Captain Sachse describes the customs both of the mountain Alfurs and the mixed peoples of the coast, and gives an outline of the history of the Dutch proceedings in the Moluccas from the time of their first appearance in the group in the year 1599. A sketch-map of Ceram is appended, and Prof. K. Martin has contributed an introduction.

#### KOZLOF'S CENTRAL ASIAN EXPEDITION OF 1899-1901.

'Mongolia i Kam. Trudi Ekspeditsii Imperatorskavo Russkavo Geographicheskavo Obshchestva sovershenno v' 1899-1901 gg. pod rukovodstvom P. K. Kozlova.' Tom. II. part i., A. N. Kaznakof, "Moi Puti po Mongolii i Kamu." Tom. III. part i., N. A. Tachalof, "Astronomicheskaya Nabliudeniya P. K. Kozlova." Tom. V, V. Bianchi, "Aves Expeditionis P. K. Kozlowi 1899-1901." St. Petersburg: 1907. Pp. 135, 20, 251.

In the notice of Kozlof's narrative (vol. 1) in vol. 28 of the *Journal*, p. 626, mention was made of excursions made by MM. Kaznakof and Ladigin with the object of broadening the belt of reconnaissance. Vol. 2, part i. contains an account by M. Kaznakof of the chief of his journeys. From the Russo-Chinese frontier at the Ulan-daba pass Kaznakof left the main expedition for the Kobdo river, from which he crossed to the Saksai, and rejoined Kozlof at Kobdo. The Dolmo lakes,

from which the Kobdo flows, were sounded, and the upper, about 17 miles long, with a maximum breadth of 4 miles, was found to have a maximum depth of 124 feet. Another excursion was commenced at the Khulmu-nor, and the southern flank of the Altai was explored, while Kozlof followed the northern flank. The Tsagan-nor which appears on many maps could not be found, but only a small lake was seen in this neighbourhood—the Khutuk-nor, about 20 miles in circumference. The Ulan-nor, seen from a distance, was in that year quite dry. Kaznakof also made a separate journey across the Gobi, visiting the lakes into which the Edzin-gol pours its waters through several channels, and passing through Fu-ma-fu and Lian-chow (Er-chow), and a short excursion in the valley of the Da-chu.

In the second of the volumes noted above the latitudes and longitudes of thirty-seven points are worked out by M. Tachalof from Kozlof's very carefully executed observations, and maps show the exact positions of those points and bearings taken from them.

The ornithological collection consisted of fifteen hundred skins, twenty-two eggs, five nests, and three skeletons. Especially interesting are the specimens from Kham. They include several new species and a new genus (*Kaznakowia*) of the *Crateropodidae* family. Other forms are now described for the first time by Prof. Bianchi.<sup>1</sup>

W. A. T.

## AFRICA.

### THE PENINSULA OF SINAI.

- 'The Topography and Geology of the Peninsula of Sinai (South-Eastern Portion).' By Dr. W. F. Hume, D.S.O., A.R.S.M., Superintendent of the Geological Survey of Egypt, Survey Department, Egypt. Cairo: 1906. 8vo, 280 pp.; 18 plates of photographs, 1 topographical and 4 geological coloured maps, and 1 plate with transverse sections.
- 'The Topography and Geology of the Peninsula of Sinai (Western Portion).' By the late T. Barron, A.R.C.S., Survey Department, Egypt. Cairo: 1907. 8vo, 241 pp.; 8 plates of photographs, 1 topographical and 1 geological coloured map, and 5 plates with transverse sections.

The peninsula of Sinai will doubtless always attract the attention of geographers, for it bears on many problems of enduring interest, from the early wanderings of the Israelites to modern speculations on climatic change, and the origin of the East African rift-valleys. In spite of its accessibility it has remained comparatively little known, owing to its extreme topographic complexity, and its arid climate; and perhaps also to idle fears of the scanty but apparently friendly natives. Most of us have learnt most of what we know of Sinai from the Penta-teuch, and one naturally first inquires of these memoirs whether there is any evidence of the supposed increasing desiccation of the lands bordering the Eastern Mediterranean. Moses' accounts of the deserts of Sinai, however, indicate that there has been no serious change since his time; indeed, the experiences of Hume and Barron suggest either that the country has more water to-day, or that they were more expert in their search for it. "Except in the coast plain between Suez and Wadi Gharandel, and the range of El Araba and Qa Plain," says Barron (p. 92), "water-supply need cause no anxiety to the traveller." The valleys in the winter are swept by heavy floods. There is water in nearly every main wadi, and in many of the side ones; there are large perennial pools, and often streams which run all the year, leaping down the cliffs in waterfalls, bordered by rich growths of maidenhair fern. In the winter rain was so frequent as to be a nuisance, and there was occasional snow. Nevertheless, the mountain massif is so deeply intersected by valleys, and so well drained, that the general impression of the whole

area is that of a rocky desert, and, to use Dr. Hume's words, "in many places . . . unmitigated desolation holds sway." The scenery is described as often grand and beautiful. The rocks are majestic and richly coloured, and the valleys contain oases described as of extreme beauty after the winter rains, being "in many places a veritable garden of flowers."

The Sinai peninsula is one geographical unit, and the reports by Dr. Hume and Mr. Barron agree as to its essential structure. It consists of a massif of crystalline and schistose rocks, including many granites and their metamorphic aureoles, which are fully described by Dr. Hume. The altered rocks include limestones and various foliated sediments. The age of these rocks is not definitely established. They are the oldest rocks in the peninsula, and are certainly pre-Carboniferous. Mr. Barron described them as post-Archean, and probably Lower Palaeozoic, but the evidence for this view is not convincing, and they may be Archean. The oldest fossiliferous rocks belong to the Carboniferous, and they are succeeded by Cretaceous, represented by Cenomanian and Neocomian series. The Cretaceous beds are the Nubian Sandstone, which has been generally regarded as *aeolian* in origin; but the authors both hold that it is *aqueous*. Dr. Hume describes it as a shallow-water marine formation, and Mr. Barron as *fluvio-marine*. The Eocene system is well represented by each of its three series: the uppermost or Bartonian series was recognized by Mr. F. Chapman from the Foraminifera, and his identification has been confirmed by the stratigraphical evidence. Miocene beds were discovered by Bauerman in 1868, and some beds which are probably Pliocene are described by Barron. The most important Pleistocene beds are some lake deposits among the mountains, some oolitic sandstones, which, if marine, prove a Pleistocene uplift of about 2300 feet, and an interesting double series of raised coral reefs, which are well described by Dr. Hume. Most of the fossils recorded have been determined by Mr. R. B. Newton.

The present topography of the area is due in the main to vertical movements along faults. The crystalline central massif of Sinai has been left as a horst (rising in Jebil Zebir to the height of 8551 feet, and in Jebel Musa, the mountain of Moses, to 7519 feet), while the surrounding country has foundered, forming the rift-valleys of the gulfs of Akaba and Suez. The fundamental importance of fault action is shown by both Dr. Hume and Mr. Barron. The movements were of great extent: thus, the fault which has dropped the sedimentary rocks of the coastal region against the crystalline horst of Sinai had a throw, according to Dr. Hume, of 15,000 feet, and the date of this great movement was so recent as the Upper Pliocene.

The earth-movements have also determined many of the chief topographical features of the land, including the position and trend of the valleys; numerous rift-valleys run parallel to the Gulf of Suez, and Dr. Hume gives a clear description of one, the Shelala um Raiyig, which is 72 kilometres long. "The main features of the Sinai peninsula," says Dr. Hume (p. 37), "have been produced by dislocation rather than erosion, fracture in three directions, either directly proved or in the highest degree probable, having determined the general structure of the country."

The economic geology is fully considered in both reports. The most interesting product is the turquoise, which is found in veins in faulted parts of the Carboniferous sandstone, and is worked by the Bedawin. There are many ore deposits of manganese, which Mr. Barron estimated may be worked at a profit. He also quoted the Nubian Sandstone and the granite as among the economic resources of the country, but Dr. Hume remarks that they have no value under existing conditions.

Both authors describe briefly the fauna and flora of the country. Animal life is

scanty, the ibex, leopard, and wolves being the most important mammals. Dr. Hume has an interesting comparison of the vegetation of Sinai with that of the eastern desert of Egypt, and describes the streaming of the plateau flora along the rift-valleys into the central mountains.

The two memoirs give full reference to previous work on Sinai, and they are illustrated by a series of excellent photographs and maps. They form a most important addition to knowledge of this neglected area. Mr. Barron's work is, alas! his last; his death in the Sudan has cut short a useful and most promising career.

J. W. G.

#### GERMAN SOUTH-WEST AFRICA.

'Deutsche Kolonialwirtschaft.' I. Band: Südwest Africa. By Dr. Paul Rohrbach. Berlin: 1907. Pp. viii. + 510. Price 10 m.

This is the first of a series of volumes which the author intends to devote to a comprehensive study of the German colonies from the purely economic standpoint. It is entirely occupied with German South-West Africa, and its special aim is to determine how far this not very inviting region is suitable for European settlement. The information embodied in the text, and the conclusions arrived at are the result of a three years' residence on the spot (1903-05) as director of a commission appointed to inquire into this and allied subjects. Owing to the outbreak of the Herero and Nama revolts, the practical question of European settlement had to be shelved for the present, and this, followed by profound differences from the authorities on some fundamental points brought about the resignation of Dr. Rohrbach, who "returned to Germany and withdrew from the colonial service." He thus secured the leisure necessary to make a calm survey of the whole situation, and give permanent expression to the conclusions he has arrived at, so far as regards the special physical and social relations prevalent in South Africa.

With the general inference that this arid or steppe region is valuable only for stock-breeding and a little market-gardening in a few favoured districts, most competent observers will fully agree. Assent will also be given to the remark that the opening up of the country, as distinct from its military occupation, must remain a purely academic question until ample provision is made for railways and other means of communication beyond the private resources of the pioneer settlers, already burdened and over-burdened with the special difficulties of an unfavourable climate and not too fertile soil. The author passes severe strictures on the "privileged associations," which, he is of opinion, should either be absolutely suppressed or else strictly compelled to comply with the expressed or implied terms of their concessions. The capital, for instance, which was promised to improve the land and prepare it for occupation, has not been advanced to any great extent, so that the associations have become obstacles rather than helps for the development of the protectorate. The tacit or avowed policy has been to do nothing until the value of the concessions has been enhanced by the indirect action of the Government measures undertaken for military and other purposes. Some judicious remarks, which will equally apply to the neighbouring British territories, are also made regarding the vital question of irrigation, showing that to buy or rent Crown lands in South Africa, and then go in quest of water, is to court failure.

But when Dr. Rohrbach comes to speak of the policy to be pursued towards the missionaries and the aborigines, he makes suggestions which will scarcely be taken seriously. "For the present," he writes, "there can be no doubt that for the treatment of our natives in South Africa, what is required is the Boer system" of apprenticeship, and that the missionaries are to be allowed a free hand only on

the express condition that their pupils be taught "no reading and writing that might lead to an understanding of any literary European tongue."

A. H. K.

#### ERITREA.

In Africa: Lettere dall' Eritrea.' Parte Prima. "Lungo l'Anseba e sull' altipiano Abissino." By Giotto Dainelli. With 152 Illustrations. Bergamo: 1908.

This volume forms one of a series of monographs issued by the *Istituto d'Arti Grafiche* of Bergamo, and dealing with travels in various parts of the world. The author and three friends visited Asmara in 1905-06, for the purpose of attending the Colonial Congress at that place. But while most of those who took part in the Congress returned home after a very brief sojourn in Eritrea, Dainelli and his friends travelled from one end of the colony to the other. It was arranged that ethnography, geology, and geography should be properly looked after, and observations recorded by each member of the party. But we are bound to say that there are very few observations of a comprehensive or detailed character recorded in the pages of the present work. It consists of letters written at short intervals from the various halting places *en route*, and though the incidents of travel are told pleasantly enough, there is no attempt at an elaboration of the subject, which would convey an exhaustive idea of the country and its possibilities, or of the economic or other success that has so far attended this Italian experiment in colonization. We presume, however, there may be another volume forthcoming, dealing with the concluding part of the tour. From a descriptive point of view the present work is good enough, and its value in this respect is certainly enhanced by admirable printing of the photographic views. Small as they are, they are reproduced with great clearness on excellent paper, a feature due, no doubt, to the artistic resources of the Institute under whose auspices the work is produced.

#### AMERICA.

##### THE MYSTERY OF THE PILCOMAYO.

'The River Pilcomayo from its Discharge into the River Paraguay to Parallel 22° S.' By Gunnar Lange. Buenos Aires: Press of the Argentine Meteorological Office. 1906.

From its first discovery the Pilcomayo has been regarded as a possible means of communication between the mining region of Bolivia and the great waterways of the Argentine. Gathering its waters from the mountains of south-eastern Bolivia, it enters the great central plain of South America as a majestic river, and it is as a broad navigable stream that it unites its forces with the Paraguay: but every attempt to follow its course between these points has been foiled by the great morass, the Estero Patiño, which interrupts its course for some 50 miles, where even in the rainy season there is insufficient water to float the shallowest craft.

The author ascended the river when it was exceptionally low, and worked in connection with a land detachment, which marched at a little distance from the right bank. He found a large portion of the swamp sufficiently firm to enable him to explore it on foot. Ultimately, dragging his boats through stretches of shallow water and over intervening tracts of dry ground, he reached the upper river, and continued his journey as far as the point where the river ceases to form the Argentine frontier with Bolivia. He has embodied the result of his survey in seven maps on a scale of 1:100,000 (1·58 miles to the inch), and a general map of 1:600,000 (9·47 miles to the inch), with numerous transverse and longitudinal sections. He has thus enabled us to follow the fortunes of the Pilcomayo from

22° S. lat., only 50 miles below the point where, after traversing a narrow gorge in the Serrania de Caiza, it leaves the mountains behind, to its union with the Paraguay, a distance of nearly 400 miles in a direct line, and about 680 following its course. During the first 176 miles it wanders in numerous meanders within the limits of its valley. The alluvium then loses its sandy character, and at the same time the river takes a more direct course. Though it is often nearly level with the plain, there are stretches where the banks are higher and rapids are met with. In many places marshy ground and sheets of water occur, but these do not assume especial importance above the junction with the Soret Satandi, 350 miles below the highest point of the survey, corresponding to a direct distance of 216 miles, during which the river has fallen 460 feet. It has at the same time diminished in volume and size of channel, having received no true affluents since it left the mountains, and any contributions from local rains being more than counterbalanced by the loss from evaporation, and overflow and leakage into the adjoining country, which is often lower than the river-level. It is flanked on the south-west by subsidiary streams draining the swamps and lagoons, which are mainly found on that side. One of these streams is the Soret Satandi. Further off, and of much greater length and importance, is the Tala or Dorado, which flows at a somewhat lower level. This carries little water, though it has a wide channel, and the Indians state that it represents the former bed of the Pilcomayo that was blocked up in a great flood.

Below the junction with the Soret Satandi, the Pilcomayo flows north-eastward into a succession of lagoons, whose low shores covered with the "totora" (*Typha dominguenensis*), a tall rush-like plant, are only broken by narrow channels, which at a short distance become merged in the marsh. What now becomes of the river is not exactly known, as the country immediately to the south-east is still unexplored, but some 35 miles away in that direction a small stream was discovered by Lieut. Olaf Storm in 1890, and identified by him with the Pilcomayo. It soon disappears, but  $1\frac{1}{2}$  miles further to the south-east emerges in a number of branches, which soon coalesce, and their united waters, gathering volume as they flow, reach, after a course of 6 miles, the low falls called the Salto Palmare by Storm, who navigated his small stern-wheel steamer up to this point, and then, transporting it overland past the falls, managed to take it 2 or 3 miles further (*Geog. Journ.*, vol. 7, p. 82 (1896)). The author found that the falls had travelled several hundred yards up-stream since they were first examined. Some 10 or 12 miles lower down the river has increased in size, but is still very small compared with the Pilcomayo before it entered the lagoons. It now unites with the Dorado, which appears to be usually somewhat larger in volume.

It was up the latter stream that Lange made his way, ultimately transporting his boats to the upper Pilcomayo by way of the Soret Satandi. From the neighbourhood of the latter the Dorado pursues a tortuous course to the south-east, sometimes flowing sluggishly in a broad channel, sometimes disappearing altogether. It finally reaches the light of day in a number of circular springs referred to as "well eyes," at the head of narrow channels some 9 feet below the surface of the marsh. These speedily unite, and the Dorado is thus reconstituted 3 or 4 miles above its confluence with the Pilcomayo.

From the Soret Satandi to the neighbourhood of the "well eyes" the marsh is nearly level, there being a fall of only about 16 feet in a direct distance of 55 miles. There is then a comparatively steep descent,\* with frequent rapids, which continue to a point 49 miles below the junction of the Dorado and Pilcomayo. Thence the river follows a nearly horizontal winding course for 188 miles to its confluence with the Paraguay.

\* In a direct distance of 25 miles the fall is more than 150 feet.

Wherever in the Estero Patiño a stream has removed the surface deposits a hard bed of carbonate of lime ("tosca") is laid bare, and the same rock is exposed in the rapids below. The author believes that this rock is impervious, and that the water makes its way through the under portion of the marsh. It is, however, probable that it has made channels for itself through the limestone, which would seem to represent the escarpment of calcareous strata dipping gently to the westward.

The waters of the Dorado and Pilcomayo, where they reunite, account for only a small portion of the volume of the upper Pilcomayo, some of which, no doubt, finds its way to the Fontana, which joins the Pilcomayo about 122 miles above its mouth, and of the remainder, what is not lost in evaporation apparently helps to feed the neighbouring affluents of the Paraguay.

The author made observations for latitude at the most important points, and these agree with those of Lieut. Storm.

J. W. E.

### AUSTRALASIA.

#### EARLY ENTERPRISE IN QUEENSLAND.

'The Discovery and Settlement of Port Mackay, Queensland.' By H. Ling Roth. Halifax: F. King & Sons. 1908. *Maps and Illustrations.* Price 10s. 6d. net.

Mr. Ling Roth, who was at one time Honorary Secretary of the Mackay Planters' and Farmers' Association, supplies in this book a most interesting chapter in the history of early Australian enterprise, and one which will be in great part new to most of his readers. His former connection with the district of which he treats has given him special facilities for ascertaining the facts of the story, and the knowledge thus gained at first hand has been supplemented by painstaking research into such literature as might help to elucidate obscure or doubtful points.

In the opening chapters the author sketches, first, the early discoveries on the east coast of Australia between 1770 and 1844, beginning, of course, with the work of Captain Cook, whose chart of this part of the coast he reproduces side by side with one of the same coast as shown by the latest surveys; secondly, the exploration of the same region by land from 1813 to 1846; and thirdly, the exploration both on the coast and inland, 1847 to 1859. In these chapters, especially the two latter, much persevering enterprise on the part of the early pioneers is rescued from oblivion, many of the names being, perhaps, little known to the world at large, though the bearers of them played their part none the less effectually in the building up of a white man's country in that remote part of the world.

Summing up the results of all the discoveries down to 1859, Mr. Ling Roth points out that while the surrounding country had become more or less known, and was being rapidly settled, the immediate district of Port Mackay was not as yet dreamt of. Its discoverer was Captain John Mackay, who is naturally to some extent the central figure of the book, and whose expedition (the subject of Chapter IV.) deserves to be somewhat particularly referred to. Leaving the gold-diggings, Mackay set out with a party in January, 1860, in search of new grazing lands. Travelling northwards between Isaacs river and Broad sound, and suffering on the dreary way much distress and sickness, they camped on May 15 at a spot in 21° 14' S., 148° 22' E., and looking thence eastwards from the top of a mountain beheld an immense level country stretching away to the coast. Two days later they came to a creek with a good supply of water, and next day to its junction with a large creek from the south, whence it flowed northwards, a deep river, to which they gave the name of Mackay river. The name Mackay having,

however, been already appropriated to a stream flowing into Rockingham bay, the name of the more southern river was in 1862 changed to that of Pioneer. The town then being surveyed on its banks was, in justice to the discoverer, named Mackay. The narrative of this important expedition is derived from Mackay's own journal, which was given to Mr. Ling Roth by its writer when on a visit to Port Mackay in 1882. The expedition yielding him no pecuniary profit, Mackay returned to his sea-calling, and for twenty years was the respected commander of various vessels in the South sea and New Zealand trade.

In the latter part of the book the progress of settlement is traced down to 1867, from which year already existing records may be said to begin. There are also notes on the natural history of the district, while the volume is illustrated by reproductions of portraits, maps, and views. Copious footnotes explain obscure points, and altogether the book represents a valuable piece of research.

### GENERAL.

#### COSMOGONY.

'Worlds in the Making: The Evolution of the Universe.' By Svante Arrhenius. Translated by Dr. H. Borns. Pp. xiv. + 230; 60 illustrations in the text. London and New York: Harper & Brothers. 1908. Price 5s. net.

No one in modern times has done more to elucidate the problem of the universe and its physical explanation than Prof. Svante Arrhenius, who has now given us, in a collected form, the results of his work and speculation. He has carried forward the nebular theory by the recognition of the effect of radiation pressure; light and heat exert a definite, if small, pressure on all objects exposed to their rays, and this pressure may balance or even exceed the effect of gravity. In the case of our sun all particles of less than 0.0015 mm., or a little less than one-thousandth of an inch in diameter, are driven off into space, where, as they come into contact with other bodies, they aggregate into meteorites; or, reaching the outer layers of gaseous nebulae, gradually form a coating, which, contracting on to the central portion, leads to a rise in temperature and the formation of stars and suns. These, ultimately, cool down on the surface, acquire a solid crust, surrounding and confining masses of highly heated and compressed gas, and float through space like gigantic bombs, till at last a collision takes place, the outer crust is fractured, the interior explodes and scatters through space to form once more a gaseous nebula; and so the universe continues in an eternal cycle, without beginning and without an end, in which life may exist for ever and undiminished. The transference of life from worlds which cease to be fit for its support to those which are reaching an appropriate condition, is provided for by the radiation pressure, which can drive minute spores, carried into the upper layers of the atmosphere by air currents, away into space, through which they travel till, ultimately, some reach a world where they can develop and start again the cycle of life, as it was started in our own world.

The system is complete—too complete, indeed, to be generally acceptable as a final explanation of the universe—but, though we cannot follow Prof. Arrhenius in his metaphysics, there can be no question of the value of his physical work, and of the service he has rendered in making its results generally accessible. For the most part these results do not directly affect geography, but his speculations regarding the nature of volcanic and seismic activity, and of the origin of the northern lights are not without geographical interest, while his demonstration of the climatic effect of small changes in the composition of the atmosphere is of special importance. According to his calculations, a doubling of the proportion of carbonic acid in the air, which amounts to about one-third of 1 per cent., would raise the mean





temperature by  $4^{\circ}$  C., and the greater proportion of water-vapour which the air would hold, in consequence of its increased temperature, would lead to a further rise of about the same amount. The coal consumed each year, at the present rate of consumption, is said to throw into the atmosphere one seven-hundredth part of its contents in carbonic acid, and, accepting Prof. Arrhenius' figures, we may calculate that this leads to a rise of the mean temperature of the Earth's surface by about one-fiftieth of a degree Fahrenheit, so that, while using up the available store of coal we are ameliorating climate and lessening our descendants' need for fuel.

R. D. O.

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### MAP OF DR. SVEN HEDIN'S RECENT JOURNEYS IN TIBET.

WE give in the present number a facsimile reproduction of a rough map which Dr. Hedin has sent to the Society, showing his routes during his last two years' journeys in Tibet. The map is necessarily rough, and is probably a reduced copy of the diagram which Dr. Hedin used in connection with his lecture at the Viceroy's palace at Simla. It will at least show the very great extent of ground covered by his routes, and, by comparing it with the Society's map of Tibet, it will be seen that he has filled up the most important blanks which are there shown.

In a communication he says, "The whole white patch on your map of Tibet, where you have the fascinating word 'Unexplored,' I have been happy enough to fill out with mighty mountain ranges, lakes and rivers, temples, innumerable names, roads, etc. Most of it belongs to the province of Bongba—Doktol is a name nobody knows. You may wonder why Ryder and Rawling did not see the Trans-Himalaya; well, it cannot be seen from their route along the Sangpo and upper Indus. Their work in Tibet is, anyhow, perfectly splendid, and their map the best that ever has been drawn there. Of course, you will easily understand that the whole east and west parts of Trans-Himalaya were known before, but one-third of the range, or rather system, situated exactly where you have the word 'Unexplored' on the Society's map of Tibet, is absolutely new, and I have been able to show very clearly that the whole lot is one single system, and this discovery is, I dare say, the greatest I have ever made during all my journeys. The map enclosed shows where I have been."

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### THE MONTHLY RECORD.

#### THE SOCIETY.

**Franco-British Exhibition.**—Intimation has been received from the Commissioner-General of the Franco-British Exhibition that a diploma for Grand Prize has been awarded to the Society for its exhibits of maps under the group of Education, and another under the class of Mathematical and Scientific Instruments. Dr. Vaughan Cornish has been awarded a Grand Prize for his exhibit of photographs of wave forms of water, sand, snow, and cloud.

## EUROPE.

**The Fate of Prof. von Knebel.**—The disaster to Prof. von Knebel's expedition to Iceland in 1907 was referred to in the *Journal* for October, 1907 (p. 436). In order to clear up the mystery attaching to the fate of the leader, his fiancée, Fräulein von Grumbkow, has this summer undertaken an expedition to the crater-lake of Askja, in company with the geologist Hans Reck, geological research being also meditated *en route*. The finding among the traveller's effects of a parcel of films dated some days later than the supposed date of the catastrophe seems to have given rise to the idea that the first accounts might have been incorrect, but Herr Spethmann has since explained that both the films and the writing on them were his own. A visit to the Askja lake was made early last summer by Herr Heinrich Erckes of Cologne (*Globus*, vol. 94, No. 10), who found no trace of Prof. von Knebel or his companion, but saw no reason to doubt that they had been drowned in the lake, possibly as a result of a fall of rock from its steep shores, instances of which he had himself more than once observed.

**Jolivet's Map of Berry.**—A copy of Jean Jolivet's map of the province of Berry, which, dedicated to Margaret of Navarre, Duchess of Berry, first appeared in 1545, has been brought to light, bound up in a set of maps mostly Italian, and dating from the sixteenth century. An article by Antoine Vacher in the *Bulletin de Géographie Historique et Descriptive* (1907, No. 2) gives an interesting and critical account of the map, including discussions of its methods of representing surface features, its location of places, its spelling of place-names, its relation to the geographical science of the time, its sources, and so forth. The volume containing the map belongs to the library of Paris University, as part of the foundation of the Jesuits' ancient library. On the fly-leaf is inscribed in writing, "Collegii parisiensis Claromontani Soc. Jesu." Originally separate, the map was sent by post to a Jesuit father. On the back, with form of address, are the words, "Au Révérend Père, Le Père Briet de la Comp<sup>e</sup> de Jésus. A Paris." The map, which is a copper engraving, measures 2·9 feet by 2·8 feet, and its six sheets are numbered in succession by the first six letters of the alphabet, beginning with the top left-hand sheet. None of the sheets, however, fits exactly with its neighbours. The ornamental frame contains, besides the map, accessory representations or commentaries, including an advertisement to the reader, dedication, indication of latitudes, a perspective of Bourges with explanation, types of ancient money of Bourges coined in the time of Lothair and Charles II., two notes concerning the extent of the diocese of Bourges and the method to be used for measuring distances, advertisement to the reader by Jacques Thiboust, who commissioned Jolivet to draw the map. The map is almost wholly confined to the diocese of Bourges, though it slightly encroaches on that of Nevers to the east, and on those of Clermont and Limoges to the south.

## ASIA.

**Prof. Musil's New Expedition.**—Prof. Musil's explorations in Northern Arabia have been frequently referred to in the *Journal*. We learn from Vienna that this traveller set out during the past summer on a new expedition for which he had prepared himself by studies in astronomy, meteorology, and physical science. This time his objective is the little-known portion of the north Arabian desert, lying inland from Koweit between Babylonia, the Persian gulf, and the Hejaz railway. His intention is to execute a topographical survey and map of this tract, which is so rich in early historical associations, at the same time making a thorough study of its archaeological and ethnographical features, including its inscriptions. The Turkish Government has shown its interest in the undertaking by granting to

Prof. Musil four firmans to the vilayets concerned, though the main objective of the expedition lies in independent Arabia. This is the eighth journey undertaken by the traveller, and it promises no less important results than any of the earlier ones. The cost is borne in part by the Austrian Government, in part by the Vienna Geographical Society and other bodies, as well as by private individuals. Its duration will probably be eighteen months. Prof. Musil reached Beyrouth, on his way to Damascus, in June last.

**Expeditions in Eastern Central Asia.**—The Russian papers are quoted in *Globus* (vol. 94, No. 11) as announcing the receipt of news of Kozloff's Central Asian expedition (*Journal*, vol. 31, p. 103). Nearly the whole of March and April were occupied in explorations in the deserts of Mongolia, while in July the proposed explorations in the basin of the Kuku-nor were to be begun. Some further details regarding the earlier stages of the expedition are given in the *Geographische Zeitschrift* (No. 9, 1908). Between Kiakhta and Urga the route of Obrucheff was followed. Here the surface features were very complicated, and no connection could be traced between structure and topography. This was also the case along the next section of the route, which led by the Tuku-nor, along the dry bed of the Onghin-gol, and across a part of the Mongolian Altai. Marine deposits connected with the old Han-hai sea were found to attain a thickness, in places, of over 600 feet. News has also been received of the arrival of the French traveller, Captain D'Ollone, at Lau-chou, which he seems to have reached from Cheng-tu via Sun-pan-ting. The announcement is made in the *Zeitschrift* of the Berlin Geographical Society of the departure of a member of that Society, Dr. Brunhuber, on an expedition for the exploration of the middle course of the Salwin. His proposed route would seem to be largely identical with that of the expedition of Messrs. Litton and Forrest lately described in the *Journal*.

**The Volcano Islands south of Japan.**—An interesting account of the group of small islands known by the above name, which lies south-south-west of the Bonin group, and forms one of the most southerly parts of the Japanese empire, is given by Mr. T. Wakimizu in the publications of the Earthquake Investigation Committee (No. 22c, Tokyo, 1908). The occasion of his visit to these islands (in Japanese "Iwojima"—a translation of the "Sulphur island" of Captain Gore, the discoverer of the largest of the group), was the report of the formation of a new island near its southern end at the close of 1904. Proceeding thither in June, 1905, for the purpose of examining the island, he found to his disappointment that the greater part had already been worn away by the waves, only a low reef, on which it was impossible to land, remaining above the water. He, however, obtained an account of its appearance and a report of its examination, earlier in the year, by some of the inhabitants of the main Iwojima, while his study of the other volcanic islands of this little known group has supplied some interesting information. The most northerly island, Kita Iwojima (or San Alessandro), is an elliptical mass rising steeply from the water (in the higher southern peak) to a height of 2534 feet. It is surrounded by a submerged platform, marking the space conquered by the sea by wave-action since the island was formed. The greater part seems to be composed of a comparatively hard volcanic agglomerate, containing a lava sheet. Most of the island is covered by a wind-swept forest, and there are no traces of recent activity. In 1899 a settlement was for the first time formed on it by Mr. Ishino. The largest island, Iwojima proper (also now inhabited), is like a gourd in shape, a low neck uniting the main mass—the low tuff-volcano Motoyama—with a cone-shaped volcano named the Pipe. The former is only 430 feet high, and the tuff bears traces of the action of the sea. This fact, together with the discovery by Mr.

Wakimizu of raised coral reefs bearing very little mark of weathering, justify the conclusion that the island is quite a recent formation, while there are indications that the land is still rising. The Pipe differs from Motoyama in all respects, being composed of stratified ash layers and lava sheets. The southernmost island, Minami-Iwojima or San Augustino, is a volcanic cone 3039 feet high. Its outline is almost circular, and the sides slope almost precipitously to the sea. It is imperfectly known, and the summit is almost constantly veiled in clouds. The island which appeared in 1904 lay 3 nautical miles north-east of Minami-Iwojima. A noise like the roaring of a cannon was first heard, and was followed by a column of smoke which changed in colour from black to white and red. The island was first distinguished on December 5, coming fully into view only on the 12th, for some time after which its shape was constantly changing. According to the report of its explorers, it was at first egg-shaped, the highest point, 480 feet above the sea, lying close to the larger end. Here it formed a precipice, at the foot of which lay a pond which Mr. Wakimizu regards as having been the centre of eruption. Explosion seems to have played an important rôle in the formation of the island, the body of which seems to have consisted of loose ashes, though some lava was poured out. On June 16, 1904, it had been reduced to a low reef, 1500 feet long and less than 10 feet high. Like the Bonin islands, the islands of the Iwojima group may be divided into two types, the one represented by the long extinct Minami and Kita-Iwojima, composed of agglomerate, the rest, still active and explosive, ejecting chiefly glassy ashes and rarely vitrophyric lavas, but never to such an extent as to augment themselves. The recent occurrence of two other submarine eruptions in these seas is recorded by Mr. Wakimizu.

#### AFRICA.

The Kamerun Expedition of Profs. Hassert and Thorbecke, the earlier stages of which were referred to in the *Journal* for August last (p. 184), has since reported to the Geographical Commission on its further proceedings, an outline of which is printed in the *Mitteilungen aus den Deutschen Schutzgebieten* (1906, No. 3). From the neighbourhood of the Kamerun mountain it made its way into the interior in a generally north-east direction, one or other of the two savants making excursions on either side in order to examine more closely the physical features of the country. The result has been to throw a good deal of new light on the general structure of this part of Africa, much of which had hardly been scientifically explored before. Broadly speaking, the country to the north-east of the Kamerun mountain appears to consist of a series of horsts and troughs, or basins of subsidence. In the neighbourhood of Johann Albrechtshöhe the Bakundu lowland—which forms, according to the German travellers, part of the West African rift-valley—divides into two branches, the western of which (traversed by the Bali road) runs north to the region of the Cross river and the Benue. The eastern branch, which the travellers followed on their outward journey, is formed by the trough of the Mungo and Kidde valleys, running between the horsts of the Bafarami and Kupe ranges to the great basin of the Mbo plateau, while from its floor rises the great volcanic mass of Manenguba. This trough is terminated by the steep escarpment of the Mbo range, which is composed of granite and primitive rocks, and marks the beginning of the grassy upland of the Northern Kamerun. On the road to Bamenda, however, traces of vulcanicity are seen, especially in the neighbourhood of the Bambulue basin, near which the volcano of Muti rises to 10,000 feet. The whole of the upland region is characterized by granite, gneiss, and mica-schists (often overlain by extensive outpourings of basalt and trachyte), and forms a

dissected plateau, composed of gently sloping eminences, separated by an irregular system of valleys. It falls by steep escarpments in various directions. Belts of *Raphia* palms line the watercourses, and the expanses of bright-green grass are broken here and there by groups of trees or bush. The settlements lie in extensive groves of plantains and oil palms, but much of the surface is uncultivated, for the density of population is here much less than has been supposed, while, on the other hand, that of forest-belt has been underestimated. In certain parts of the grassland the climate might be suitable for European agricultural settlements; but any attempt in this direction would be attended with risk. The more advanced political organization of the grasslands facilitates travel, while the roads are also better here than in the forest-belt.

**African Boundary Surveys.**—It may be useful to record the progress made during the present year with various surveys for the demarcation of African boundaries. The field-work of two important commissions—that for the marking of the frontier between Northern Nigeria and the French Sahara, and that for the exact survey of the region traversed by the Uganda-Congo State frontier—was completed during the first half of the year, though in the case of the latter the final adjustment of the frontier remains to be effected by negotiation in Europe. It may be hoped that this will make some definite progress now that the future political status of the Congo has been settled by the decision of Belgium to take over the State as a Belgian colony. The surveys along the line of the Nigeria-Kamerun frontier between the Cross river and Yola are still in progress, the two commissions having returned to the task during the present autumn. Some account of the work accomplished during the first season is given in the *Deutsches Kolonialblatt* for September 15 last. The triangulation on which the survey is based was connected with that of the boundary survey between Yola and Lake Chad. It was carried out by the two parties independently, the chains of triangles being, however, of course, linked together in the centre. The two surveys are said to have shown a satisfactory agreement, both as regards the co-ordinates of points and the cartographic representation of the country. The work was much impeded by the difficulties of the country, the unhealthy climate (the leader of the German section, Major Haering, has been forced to retire from the work and has been succeeded by Lieut. von Stephani), the hostility of the natives, and other causes, but about half the survey was completed, viz. to 7° 40' N. Another boundary, which is at present occupying the attention of a survey-commission, is that between Togo and Dahome, the preliminary survey, carried out in 1898, having been considered not sufficiently precise for the final delimitation. The work, which is expected to occupy eight months, has lately been begun (*Globus*, vol. 94, No. 10). The delimitation of the Franco-Liberian boundary (*Journal*, vol. 30, p. 105) is also in progress. France is represented by M. Richaud and others, Liberia by MM. Naber and Moret, officers of the Dutch navy. From Konakri the two parties proceeded by rail to the interior, reaching Farana in June last, *en route* for the upper course of the Makona at the north-western end of the inland frontier. On the opposite side of the continent, Major Gwynn has organized an Expedition for the demarcation of the southern boundary of Abyssinia (which has been arranged), while a survey has lately been carried out along the mutual frontier of German and Portuguese East Africa.

**Lieut. Cortier's New Expedition.**—Lieut. Cortier, whose previous work in the Sahara has more than once been referred to in the *Journal*, has been entrusted with the command of a new expedition, the principal object of which is to obtain by astronomical observations a trustworthy basis for the map of the southern part of the French Sahara. According to the August number of the *Revue Française*, he was to go south from Algeria, and, after being joined by Li-ut. Niéger, to

take the route to Air by the east of the Hoggar plateau. Further points on the proposed line of route are the Eastern Adrar, Kunta, Azauad, and Taodeni, from which last Lieut. Cortier hopes to return by way of Senegal.

**Dr. Pöch's Expedition in South Africa.**—Further reports of the progress of this expedition (*Journal*, vol. 30, p. 334; 31, p. 687) have been received at Vienna. Reaching Oas, in German South-West Africa, on January 30, 1908, the traveller occupied himself here and elsewhere with anthropological measurements and photography of the Bushmen, taking also kinematograph records of their dances. At the time of writing he proposed to make an early start for Rietfontein. The rainy season, which had just passed, had brought but little precipitation, the February amount, on fourteen days, being only 90 millimetres (3·5 in.; heaviest fall at one time 22·8 millimetres, or 0·9 in.), and that for March, on two days, only 8 millimetres (0·3 in.). Dr. Pöch's intention was to devote his most serious work to the Bushmen of the Khanseveld.

#### AMERICA.

**The Alaska Boundary Demarcation.**—In accordance with the provisions of the convention under which the Alaska boundary was submitted to arbitration in 1903, commissioners were appointed by Great Britain and the United States within a few months of the promulgation of the award, for the marking on the spot of that part of the boundary which had been the subject of dispute. The work has been energetically prosecuted under the joint superintendence of Dr. W. F. King, chief astronomer for Canada, and Mr. O. H. Tittmann, of the Coast and Geodetic Survey of the United States. Reports of progress by both these commissioners have lately been received, though neither of them brings the statement of work done beyond the end of 1907, and Dr. King's report, which forms part of the annual report of the Department of the Interior for 1905-6, is dated in October of the latter year. Mr. Tittmann's report has appeared in the *Proceedings of the American Philosophical Society* for the present year (pp. 86-90). The work which devolved on the commissioners was to identify the peaks marked on the maps used by the arbitration tribunal, to establish their geographical position, to mark by monuments the turning points of the line and such other points as might be necessary, and to describe and define the line between the points selected by the tribunal. Over a stretch of about 120 miles additional surveys had to be made, and peaks selected within certain prescribed limits to fix the boundary. Early in 1908, Mr. Tittmann reported that the commissioners had fixed trigonometrically all the peaks except two near Mount St. Elias and those in the region between the Whiting river and Devil's Thumb, and some of the peaks south of the Unuk river. The passes, valleys, and river crossings had been monumented with the exception of the crossing of the Alsek in the north, and the valleys of the affluents of the Iskut and the crossings of the Le Duc and Chicamin rivers in the south. The turning points of the water-boundary in Portland canal also remained to be fixed by reference to points on shore. This demarcation was not concerned with that part of the boundary which follows the 141st meridian, which had never been in dispute, but by the treaty signed at Washington in August, 1906, provision was made for the survey and demarcation of this line also, under the same commissioners. Owing to local deflection of the plumb-line the astronomically determined position of the meridian in question could not be relied on to be a straight line, and it was therefore determined to fix exactly the point at which that meridian is crossed by the telegraph line along the Yukon, and then trace a north and south line through this point. Before the close of the summer of 1906, a telegraphic determination of the intersection of the Yukon by the 141st meridian had been completed, the Canadian

party under Dr. Klotz effecting an interchange of signals between Vancouver and the boundary, while the American observers connected the latter with Seattle by way of Sitka, Valdez, and Fort Egbert. The circuit was closed by determining the difference between Seattle and Vancouver, and a very satisfactory agreement obtained. The transit pier erected for the exchange of time signals was found to be in longitude  $141^{\circ} 0' 0''\cdot4$ , a very close hit, as Mr. Tittmann remarks, while the final longitude differed by only 410 feet from that obtained by moon culminations about twenty years before. The work of tracing the boundary southward from the Yukon, begun in 1907, was in that year carried on for a distance of about 120 miles, while it was to be continued as far as possible during the summer of this year.

**Standard Time for Peru.**—The *Zeitschrift* of the Berlin Geographical Society (1908, No. 7) records the fact that a standard time has been lately adopted by Peru, viz. that of the 75th meridian west of Greenwich, which divides the country almost equally into an eastern and a western section. It will coincide with the time in use in the eastern United States, also determined by the 75th meridian, which passes very near the city of Philadelphia.

**Expeditions in South America.**—We learn from *Globus* (vol. 94, No. 11) that Dr. Farabee's expedition to Peru and Bolivia, which went out early in 1907 under the auspices of the Peabody Museum (*Journal*, vol. 29, p. 229), has already carried out some valuable work (more particularly in ethnology) in the region of the headwaters of the Madeira. From Arequipa the expedition went *viâ* Tirapata and the Aracoma pass to the Tambopata, which was navigated to its junction with the Madre de Dios. After further work in the region of the Mamore, it made its way to Santa Rosa and Cochabamba, and thence by Lake Titicaca back to Tirapata. Two members of the party have returned to the United States, but Dr. Farabee is continuing his investigations with the aid of his third companion, Mr. Horr. In the tenth number of the same periodical it is announced that Mr. R. R. Schuller (who, according to the 'Geographen-Kalendar,' is, or was till lately, keeper of the ethnological section of the National Museum at Montevideo) has undertaken a journey for linguistic and anthropological research in Eastern Peru, during which he hopes *inter alia* to visit some of the wild tribes of the Ucayali basin. The Andean tableland is the objective of an expedition undertaken by Dr. Walter Knocke, who, according to the *Zeitschrift* of the Berlin Geographical Society (1908, No. 7), started in August, accompanied by his wife. He expects to be absent two years, his object being to carry out various physical researches in the region selected. These will include investigations of atmospheric electricity, and of the radio-activity of the air, water and soil, as well as careful observations in regard to meteorology, including in particular solar radiation.

#### AUSTRALASIA AND PACIFIC ISLANDS.

**Observations on the Great Barrier Reef.**—During the year 1906 Messrs. C. Hedley, of the Australian Museum, Sydney, and T. G. Taylor, of the Geological Department of the University of Sydney, carried out careful traverses of three different reefs, in various and progressive stages of growth, in the neighbourhood of Cooktown, Queensland, with a view to obtaining definite information as to the superficial geological structure and distribution of life along actual sectional lines. The data thus obtained were put before the meeting of the Australian Association at Adelaide last year in a paper of which a reprint has lately been received, and in which the authors, besides describing in detail the results of their observations, draw conclusions as to various questions connected with the formation of reefs,

and the general physical history of Eastern Australia and the Great Barrier reef. One of the special points touched upon is that of the origin of "Negroheads," the term first applied by Flinders to the rows of crags irregularly disposed along the crest of many of the reefs of the Great Barrier, and formed of masses of dead coral 5 or 6 feet in height and of nearly equal breadth. Whilst Agassiz held them to be remnants of elevated reefs cut down by erosion, the writers agree with Saville Kent in regarding them as jetsam flung up by hurricanes; showing that they do not continue down to the ground, and always occur on the windward side of the reefs, or that on which an elevated reef would be soonest attacked by denudation. As regards the cycle of growth of an individual reef, the writers hold that if the nascent reef reaches the surface across the wind, its extremities are gradually produced so that it forms a crescent with the convexity to windward. As the process continues the shape becomes a horseshoe, and lastly an oval, enclosing a lagoon. If there is no continued subsidence, the walls broaden, while the lagoon eventually becomes filled up by the *débris* constantly transported across the reef by the water. In this way the so-called "cays," or flat wooded islands of coral origin, are held to have originated. The hilly timbered islands, which represent another type along the Queensland coast, are regarded as evidently due to a subsidence of the coast-line, which may have amounted to as much as 200 feet, and which, in the writers' opinion, is also evidenced by the form of the coast-line (its drowned valleys, etc.), and the separation of the Cape York peninsula from New Guinea. With this subsidence is correlated a probable elevation of the Australian interior between the 135th and 140th meridians as indicated by the large areas of Tertiary deposits, the two movements seeming to be due to a tectonic rocking about the north and south mountain axis. As further indications of subsidence in the Barrier region, the authors point to the steepness of its outer face as shown by recent Admiralty surveys, and to the ejections of dolomitic coral blocks by the extinct volcano of the Murray islands. However this may be, they show no reason for believing that subsidence must be a universal accompaniment of coral-reef formation.

**German Ethnological Expedition to the Bismarck Archipelago.**—This expedition, which was organized a year ago by the Prussian Ministry of Education, and placed under the direction of Dr. Emil Stephan, has been unfortunate in losing its leader during the past summer. Dr. Stephan, who was a young and promising ethnologist (see reviews of works from his pen in the *Journal*, vol 30, pp. 204, 205), died in New Mecklenburg on May 25. The leadership of the expedition has, we learn from *Globus*, vol. 94, No. 7, been taken over by Dr. Krämer, whose former work in the Western Pacific is well known.

#### POLAR REGIONS.

**Swedish Expedition to Spitsbergen.**—During the past summer an expedition, sent out by the Swedish Government under the leadership of the well-known geologist, Baron de Geer, has been at work in Spitsbergen, the special field of investigation being Ice fiord and the glaciers debouching thereon. A preliminary account of the work accomplished is quoted from the *Dagens Nyheter* of Stockholm in *Globus* (1908, No. 10). Before reaching Ice fiord the expedition, which included various experts in addition to the leader, visited Horn sound and Bell sound. The greater part of the previously uncharted coasts of Ice fiord had been surveyed, and a large part of it sounded, while observations of glacier-changes had been made, and other geological and zoological researches carried out. A visit was paid to the coal-mines on Advent bay, which gave signs of great activity on the part of the hundreds of people engaged in their exploitation. Shops at which goods could be bought at moderate prices were in evidence.

**Expeditions in Arctic America.**—Knud Rasmussen, one of the companions of the late Mylius Erichsen on his first Greenland expedition, set out in 1906 on a new expedition to the same region, from which he has lately returned to Copenhagen. During 1907 he carried out a successful sledge expedition from the Greenland side, across Smith sound, to Ellesmere Land. This was intended to be preliminary to a journey of a more extended character through the Arctic archipelago of North America, which the explorer is understood to be planning for next year, its special object being a study of the Eskimo of that region. Another expedition which has been in the field for over a year is that of Dr. F. A. Cook, well known for his previous Arctic and Antarctic journeys and for his ascent of Mount McKinley, in Alaska. This traveller set out in 1907 in the hope of pushing north towards the pole by a route to the west of Ellesmere Land, but no news had been obtained of him down to August of the present year. Some anxiety is therefore felt on his account. It may be mentioned that news of Peary's safe arrival at Etah, in northern Greenland, has been received. Mr. Stefansson, one of the members of Mr. Mikkelsen's recent Expedition to the Beaufort sea, has this year gone north for further ethnological work in the region of the Lower Mackenzie, accompanied by Mr. Anderson, a biologist.

#### MATHEMATICAL AND PHYSICAL GEOGRAPHY.

**A New Sounding Machine for Rivers and Small Lakes.**—The inaccessibility of many of the smaller lakes and tarns of mountain regions has very generally stood in the way of a measurement of their depths, even when this might be of importance in connection with their possible utilization as a source of water-power or supply. When examining the tarns of the Canton Ticino (*Journal*, vol. 28, p. 177), Prof. Garwood was impressed with the need of an instrument which would permit the bathymetrical survey of any mountain lake without the use of a boat. With the assistance of a grant from the Royal Society, he devised an experimental model which was afterwards improved and used with success on some of the tarns above alluded to. The experience thus gained has enabled him to introduce further alterations and additions, and the resulting machine is described by him, with illustrations, in the *Proceedings of the Royal Society*, Ser. A, vol. 81, p. 243. Its use may be briefly explained thus: The machine consists of two posts erected on opposite sides of the lake or river, manipulated respectively by the observer and his assistant, and connected by a line, to which is attached a float carrying a pulley for the plummet line to pass over. The post worked by the assistant merely carries a drum by means of which the float can be hauled in or let out as required. That worked by the observer is provided with two drums, accurately paired and placed on opposite sides of the post. They work on a common axle and can be coupled by means of a spring bolt. The line from the float is fed on to one drum by means of pulleys, while that from the plummet, which eventually finds its way to the other drum, is first passed over a counting machine consisting of a driving pulley marked in inches, to which are geared other counting discs registering feet, tens of feet, and hundreds of feet respectively. The posts having been suitably fixed, the two drums on the observer's post are coupled, the counting machine is set to zero, and the float hauled out by the assistant to a given distance, which is registered by the discs. The drums are then uncoupled, and the sounding line is allowed to run out until the plummet touches the bottom, when the depth is obtained by deducting the distance of the float from the post, from the total registered by the counting machine. The line is then wound in, the drums are coupled again, the float is hauled to a new position and a second sounding taken. The machine is provided with various contrivances for checking undue speed, maintaining an even tension, preventing piling

of the lines on the drums, and so on. The counting machine is marked with two sets of figures, in black and red, registering in opposite directions, and so recording either the amount of line let out or the amount drawn in. The apparatus can easily be carried by one man even in mountain districts, and it seems eminently adapted for the purpose for which it is intended, the slight degree to which it is affected by an ordinary breeze, and the automatic record supplied by it of the depth and position of each sounding, being particularly valuable features.

**German Oceanographical Expedition.**—According to a statement by Prof. Schott in the *Annalen der Hydrographie* (1908, No. 9), Dr. R. Lüftgens, of Hamburg, has undertaken, at the instance of the German "Seewarte," an expedition with the special object of experimental investigations into the conditions of evaporation over the sea and their regional variation. It is pointed out that inasmuch as the sea is the source of most of the atmospheric moisture, the importance of such a study, towards the prosecution of which little has yet been done, is undoubted. The voyage will be made in the four-masted barque *Pangani*, Captain Junge, and the route chosen is that across the Atlantic and round Cape Horn to the west coast of South America. This route will, it is hoped, permit a study of evaporation under the most diverse climatic conditions.

**The Humidity of the Air in Town and Country.**—A recent study by V. Kremser, which appeared in the *Meteorologische Zeitschrift* for May of this year, shows the decided influence exercised by large towns on the humidity of the air in them. The writer has made a comparison of the meteorological data for Paris, Vienna, Berlin, and certain other cities of the North German plain, with those of suitably chosen stations in the country near them, the result being to show that the town atmosphere is for nearly the whole year both absolutely and relatively drier than that of the country, the difference being most marked at the height of summer, while in winter the relation may be occasionally reversed. In the case of the North German stations the mean vapour pressure for the year is 0.4 millimetre higher in the country than in the town, while the relative humidity shows, for the year, a difference of 6 per cent. These figures are more striking if we consider the normal variation of the two elements in the North German plain as a whole, that of the vapour pressure amounting at the most only to 0.9 millimetre yearly, and that of the relative humidity only to 10 per cent. The explanation is to be found in part in the difference of temperature, itself due to known causes, but in part also in the difference of absolute humidity. The higher temperature of the towns might be supposed to increase the absolute humidity by favouring evaporation. That it does not might be explained as a result of the dust and smoke in the atmosphere of towns, which favour condensation, were it not that the seasonal variation does not accord with this supposition. The reason is rather the difference in the condition of the ground in town and country, drainage being so much more rapid in the former that the moisture contained in it, and therefore the evaporation, is less. The writer also enters into the question of the differences of humidity between town and country at various hours of the day. The variation of the vapour pressure is found to be roughly parallel with that of temperature, while in the case of the relative humidity the difference between town and country shows itself above all in the summer evenings, when it amounts to from 12 to 15 per cent.

#### GENERAL.

**The Leeds and Yorkshire Geographical Society.**—This new Society, the early steps for the formation of which were referred to in the *Journal* last March, was formally inaugurated on October 2, when an enthusiastic meeting was held in the Albert Hall of the Leeds Institute. The chair was taken by Mr. F. Wardle,

President of the Leeds Chamber of Commerce, and the audience numbered about 1000. The inaugural address was given by Sir Clements Markham, who spoke of the important geographical work done in the past by famous Yorkshiremen, beginning with John Holywood, of Halifax, known abroad as Sacrobosco, whose thirteenth-century treatise on the sphere was for two centuries regarded as the standard work on geography. Among the many other names alluded to, those of Henry Briggs, Frobisher, Luke Fox, and Captain Cook came in, naturally, for their due share of attention; while of more modern times such men as Governor Eyre, Charles Waterton, T. W. Atkinson (of Siberian fame), Richard Spruce, and others still living, were mentioned as distinguished Yorkshire geographers. This was followed by an illustrated lecture on the Andes of Peru. Sir Clements appears to have fired his audience with something of his own enthusiasm, and he was warmly thanked for his services to the new society, his omission to include himself in the roll of famous Yorkshiremen being duly rectified by subsequent speakers. A unanimous desire was expressed that the address might be printed, and it is hoped that this may be arranged for at once.

**Distribution of Population in the United States: Erratum.**—In Prof. Brigham's article on this subject in the October number, line 9 from the end of the article, the word "casually" should be "causally."

## GEOGRAPHICAL LITERATURE OF THE MONTH.

### *Additions to the Library.*

By EDWARD HEAWOOD, M.A., *Librarian, R.G.S.*

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the sources of articles from other publications. Geographical names are as a rule written in full:—

A. = Academy, Academie, Akademie.  
 Abb. = Abhandlungen.  
 Ann. = Annals, Annales, Analen.  
 B. = Bulletin, Bollettino, Boletim.  
 Col. = Colonies.  
 Com. = Commerce.  
 C.R. = Comptes Rendus.  
 E. = Erdkunde.  
 G. = Geography, Géographie, Geografia.  
 Ges. = Gesellschaft.  
 I. = Institute, Institution.  
 Iz. = Izvestiya.  
 J. = Journal.  
 Jb. = Jahrbuch.  
 k.k. = kaiserlich und königlich.  
 M. = Mitteilungen.

Mag. = Magazine.  
 Mém. (Mém.) = Memoirs, Mémoires.  
 Met. (mét.) = Meteorological.  
 P. = Proceedings.  
 R. = Royal.  
 Rev. (Riv.) = Review, Revue, Rivista.  
 S. = Society, Société, Selskab.  
 Sc. = Science(s).  
 Sitzb. = Sitzungsbericht.  
 T. = Transactions.  
 Ts. = Tijdschrift, Tidskrift.  
 V. = Verein.  
 Verh. = Verhandlungen.  
 W. = Wissenschaft, and compounds.  
 Z. = Zeitschrift.  
 Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

### EUROPE.

#### Balkan Peninsula.

Washed by four seas: An English officer's travels in the Near East. By H. C. Woods. London: T. Fisher Unwin, 1908. Size 9 × 6, pp. xvi. and 316. *Map and Illustrations.* Price 7s. 6d. net. Presented by the Publisher.

Woods.

**Europe.****Harms**

Erdkunde in entwickelnder, anschaulicher Darstellung, von H. Harms. **Zweiter Band: Länderkunde von Europa, einschliesslich Völker- und Wirtschaftskunde.** Leipzig: List und von Bressensdorf, 1908. Size 9 × 6, pp. xvi. and 500. *Maps and Illustrations.* Price 5s.

A feature in this book is the abundance of sketch-maps and diagrams, which bring home the facts in a graphic way.

**Europe.****Neumann.**

Länder- und Staatenkunde von Europa (Allgemeines) und Mitteleuropa (Deutsches Reich, Schweiz, Österreich-Ungarn). Von Dr. Ludwig Neumann. (Sonderabdruck aus: A. Scobel, Geographisches Handbuch; Fünfte . . Auflage.) Bielefeld und Leipzig: Velhagen & Klasing, 1908. Size 10 × 7, pp. iv. and 410-700. *Maps, Illustrations, and Diagrams.* Presented by the Author.

**Europe—Relief.****Andrews and Dickinson.**

Notes on the orographical map of Europe. By A. W. Andrews and B. B. Dickinson. London: Macmillan & Co., 1908. Size 8½ × 5½, pp. 30. *Sketch-maps.* Price 1s. Presented by the Publishers.

A guide to the use of the map referred to in the October number (p. 445), bringing out the most important lessons to be learnt from it.

**France—Corsica.****Chapman.**

Corsica: an island of rest. By John Mitchell Chapman. London: E. Stanford, 1908. Size 8½ × 5½, pp. xii. and 380. *Map and Illustrations.* Price 7s. 6d. net. Presented by the Publisher.

**France—Lot.****Viré.**

Le Lot: Padirac, Rocamadour, Lacave. Guide du Touriste, du Naturaliste et de l'Archéologue. Par Armand Viré. Paris: Masson et Cie., 1907. Size 7 × 4½, pp. viii. and 310. *Maps and Illustrations.* Price 4 fr. 50.

One of an excellent series of guides to regions of France.

**Italy—Abruzzi.****Macdonell.**

In the Abruzzi. By Anne Macdonell. London: Chatto & Windus, 1908. Size 8½ × 5½, pp. x. and 310. *Map and Illustrations.* Price 6s. net. Presented by the Publishers.

**Spain.****Calvert.**

Valladolid, Oviedo, Segovia, Zamora, Avila, and Zaragoza. An historical and descriptive account, by Albert T. Calvert. London: John Lane, 1908. Size 7½ × 5, pp. xxiv. and 162. *Illustrations.* Price 3s. 6d. net. Presented by the Publisher.

**Sweden—Fauna.**

Arkiv Zoologi 4 (1908), No. 5: pp. 136.

**Théel.**

Om utvecklingen af Sveriges zoologiska hafsstation Kristineberg och om djurlifvet i angränsande haf och fjordar. Af Hjalmar Théel. *Maps and Illustrations.*

**Sweden—Norrländ.**

Ymer 28 (1908): 17-83.

**Sjögren.**

Strandlinjer och isajöar vid Torneträsk. Af Otto Sjögren. *Maps, Illustrations, and Diagrams.*

Traces the contours of former glacial lakes by the aid of old shore-lines in the region of Lake Tornea.

**Sweden—Norrländ—Rivers.**

Ymer 28 (1908): 60-68.

**Högbom.**

Till frågan om de norrländska älflarnas vattenhushållning. Af A. G. Högbom.

On the hydrology of the rivers of Norrländ.

**Switzerland—Geneva.**

Scottish G. Mag. 24 (1908): 225-238, 281-290.

**Dingelstedt.**

The Republic and Canton of Geneva. A demographical sketch. By Victor Dingelstedt.

**Switzerland—Solothurn.****Buxtorf and others.**

Beiträge Geol. Karte Schweiz, N.F. 21 (1908): pp. xii. and 148.

Geologische Beschreibung des Weissensteintunnels und seiner Umgebung. Von Dr. Aug. Buxtorf, Dr. E. Künzli, und Dr. L. Rollier. *Maps and Sections.*

**Switzerland—Zürich.****Hug.**

Beiträge Geol. Karte Schweiz, N.F. 15 (1907): pp. xii. and 128.

Geologie der nördlichen Teile des Kantons Zürich und der angrenzenden Landschaften. Von Dr. J. Hug. *Maps.*

- Turkey—Albania.** *Abh. K.K.G. Ges. Wien* 7 (1908): No. 1, pp. 76. **Ippen**  
Die Gebirge des nordwestlichen Albaniens. Von Th. A. Ippen. *Illustrations.*
- Turkey—Parga.** **Ludwig Salvator**  
Versuch einer Geschichte von Parga. [By the Archduke Ludwig Salvator.]  
Prague: H. Meroy Sohn, 1908. Size 21 × 15, pp. viii. and 220. *Illustrations.*  
Presented by H.I.H. the Archduke Ludwig Salvator.
- United Kingdom—Dublin.**  
Handbook to the City of Dublin and the surrounding district, prepared for the meeting of the British Association, September, 1908. Dublin, 1908. Size 7½ × 5, pp. viii. and 442. *Map and Illustrations.*  
Prepared under the Editorship of Prof. Grenville Cole and Mr. R. L. Præger.
- United Kingdom—Kent.** **Bennett.**  
The White Horse stone and its legend. By F. J. Bennett. [West Malling, 1907.]  
Size 8½ × 5½, pp. 12. *Illustrations.*
- United Kingdom—Meteorology.** *Quarterly J.R. Meteorol. S.* 34 (1908): 65–86. **Mill.**  
Map studies of rainfall. By Dr. H. R. Mill. *Maps.*
- United Kingdom—Scotland.** **Gwinnell.**  
A hill country: its physical features and their significance. By Russell F. Gwinnell. London: G. Philip & Son, 1908. Size 7½ × 5, pp. vi. and 26. *Maps.*  
Price 1s. net. Presented by the Publishers.  
An instructive sketch of the surface features and scenery of the Northern Clyde basin, as determined by geological structure, etc.
- United Kingdom—Scotland—Colonsay.** **Wright.**  
*Quarterly J. Geol. S.* 64 (1908): 297–312.  
The Two Earth Movements of Colonsay. By William Bourke Wright. *Sketch-maps and Illustrations.*
- United Kingdom—Seismology.** *Geological Mag.* 5 (1908): 296–309. **Davison.**  
On some minor British earthquakes of the years 1904–1907. By Dr. Charles Davison. *Sketch-maps.*
- United Kingdom—Thames.** *J.S. Arts* 56 (1908): 656–671. **Beadle.**  
Some observations upon the underground water supplies to the Thames basin. By Clayton Beadle.
- United Kingdom—Waterways.**  
Royal Commission on Canals and Waterways. Vol. iv. Returns supplied to and prepared by the Royal Commission on Canals and Waterways, 1907. Comprising the history, the extent, the capital of, and the traffic and works of the canals and inland navigations of the United Kingdom. London: Wyman & Sons, 1908. Size 13 × 8½, pp. iv. and 510. *Maps.* Price 7s. 2d. Presented.
- ASIA.**
- Chinese Empire—Tibet.** **Hedin.**  
My discoveries in Tibet. By Dr. Sven Hedin. (From *Harper's Monthly Magazine*, London, Nos. 699 and 700, August and September, 1908.) Size 9½ × 6½, pp. 339–348, 545–555. *Map and Illustrations.*  
An account of the journey from Shigatze to Manasarowar in 1907.
- India—Assam.** **Hodson.**  
The Meitheis. By T. C. Hodson, with an introduction by Sir Charles J. Lyall. (Published under the orders of the Government of Eastern Bengal and Assam.) London: D. Nutt, 1908. Size 8½ × 5½, pp. xviii. and 228. *Map and Illustrations.*  
Price 7s. 6d. net. Presented by the Publisher.
- India—Assam.** **Stack and Lyall.**  
The Mikirs. From the papers of the late Edward Stack; edited, arranged, and supplemented by Sir Charles Lyall. (Published under the orders of the Government of Eastern Bengal and Assam.) London: D. Nutt, 1908. Size 8½ × 5½, pp. xx. and 184. *Map and Illustrations.* Price 7s. 6d. net. Presented by the Publisher.
- Japan—Hokkaido.**  
Report on the Hokkaido. (Foreign Office, Miscellaneous, No. 668, 1908.) Size 9½ × 6, pp. 48. Price 2½d.

- Japan—Sea-level.** *B. Imp. Earthquake Investigation Com.* 2 (1908): 35-50. Omori.  
On the Annual Variation of the Height of Sea-level along Japanese Coasts.  
Second paper. By F. Omori. *Map and Diagrams.*
- Japan—Topography.** Yamasaki.  
The topography of Japan. By Naomasa Yamasaki. (Reprinted from the *Encyclopedia Americana.*) Size 10 × 6½, pp. 10. *Presented by the Author.*
- Malay Archipelago—Flores.** Couvreur.  
*Ts. K. Nederland. Aardr. Genoots.* 25 (1908): 551-566.  
Een dienstreis benoorden Larantoea (Oost-Flores), April 23-28, 1907. Door A. J. L. Couvreur. *Map.*
- Malay Peninsula—Rubber.** Asimont.  
Hevea Brasiliensis, or Para rubber, in the Malay Peninsula. Notes and figures in connection with the cultivation of Para rubber. By W. F. C. Asimont. London: L. Upcott Gill, [1908]. Size 7½ × 5, pp. 64. *Presented by A. S. Ellam, Esq.*
- Malay States.** Wright and Cartwright.  
Twentieth century impressions of British Malaya: its history, people, commerce, industries, and resources. Edited by Arnold Wright and H. A. Cartwright. London: Lloyd's Greater Britain Publishing Co., 1908. Size 12½ × 9½, pp. 960. *Illustrations and Map. Presented by the Crown agents for the Colonies.*
- Philippine Islands.** Ferguson.  
*Philippine J. Sci.* 3 (1908): 1-27.  
Contributions to the physiography of the Philippine Islands. II. The Batanes Islands. By Henry G. Ferguson. *Maps, Sections, and Illustrations.*
- Tibet—Kuen-Lun.** Longstaff.  
*Alpine J.* 24 (1908): 133-138.  
A note on W. H. Johnson's ascents in the Kuen-Luen. By T. G. Longstaff.  
Shows that there is good reason for crediting the accuracy of the altitudes assigned to Mr. Johnson's highest ascents.
- Turkey—Asia Minor.** Kiewel.  
*Z. Ges. E. Berlin* (1908): 317-335.  
Ergebnisse der Höhenmessungen von Prof. A. Philippson im südwestlichen Kleinasien im Jahre 1904. Von O. Kiewel.
- Turkey—Palestine.** Masterman.  
*Palestine Explor. Fund, Quarterly Statement* (1908): 229-244.  
Notes of a visit to Engedy, Masada, and Jebel Usdum. By Dr. G. W. G. Masterman. *Illustrations.*
- Turkey—Railway.** Auler.  
*Petermanns M., Ergänzungsheft* 161 (1908): pp. 66.  
Die Hedschasbahn. II. Teil: Ma'an bis El 'Ula. Auf Grund einer zweiten Besichtigungsreise und nach amtlichen Quellen bearbeitet von Auler Pascha. *Map and Illustrations.*  
See note in the Monthly Record for September (p. 305).

## AFRICA.

- Canary Islands—Volcanoes.** Brun.  
Quelques recherches sur le volcanisme au Pico de Teyde et au Timanfaya (troisième partie). Par Albert Brun; avec la collaboration . . . de H. F. Montagnier. (Extrait des 'Archives des sciences physiques et naturelles,' février 1908.) [Geneva, 1908.] Size 9 × 6, pp. 26. *Illustrations.*
- German East Africa.** Mecklenburg.  
*M. deuts. Schutzgebieten* 21 (1908): 150-156.  
Expedition—S. H. des Herzogs Adolf Friedrich zu Mecklenburg.  
Reports on the scientific results (see September number, p. 307).
- Italian East Africa.** Blesich.  
*B.S.G., Italiana* 9 (1908): 672-685.  
Le frontiere tra l'Abissinia e la Somalia e Danalia italiane. Di Aldo Blesich. *Map.*  
See note in the June number, p. 676.
- Ivory Coast.** Chevalier.  
*La G. B.S.G.* 17 (1908): 201-210.  
La forêt vierge de la Côte d'Ivoire. Par Auguste Chevalier. *Sketch-map.*
- Kamerun.** Stein.  
*Deutsches Kolonialblatt* 19 (1908): 521-531.  
Eine Erkundungs-Expedition zwischen Wuri und Sanaga. Bericht des Hauptmanns Frhr. v. Stein. *Sketch-map.*  
See note in the September number (p. 307).

- Liberia.** *Quarterly J. Geol. Sc.* 64 (1908): 318-317. **Parkinson.**  
A note on the petrology and physiography of Western Liberia (West Coast of Africa).  
By John Parkinson. *Sketch-map.*
- Madagascar.** *Rev. Madagascar* 10 (1908): 241-251. **Berthier.**  
Les grands lacs de Madagascar. La région du lac Itasy. Par H. Berthier.
- Morocco—Atlas.** *La G., B.S.G.* 17 (1908): 177-200. **Gentil.**  
Itinéraires dans le Haut Atlas marocain. Par Louis Gentil. *Map and Illustrations.*
- Morocco—Ports.** *S.G. Comm. Paris* 30 (1908): 175-199, 313-337, 405-430. **Dy6.**  
Les ports du Maroc. Leur commerce avec la France. Par A.-H. Dyc. *Sketch-map.*
- Nigeria—Languages.** **Brackenbury and others**  
A short vocabulary of the Fulani language. Compiled by E. A. Brackenbury. Zungeru, 1907. Size  $6\frac{1}{2} \times 4\frac{1}{2}$ , pp. 38.  
Vocabulary of the Jukon language. Compiled by W. K. Fraser. Zungeru, 1908. Size  $6\frac{1}{2} \times 4\frac{1}{2}$ , pp. 38.  
Ghari grammar notes and vocabulary. Compiled by Rev. W. P. Low. Zungeru, 1908. Size  $6\frac{1}{2} \times 4\frac{1}{2}$ , pp. 18.  
English-Okpoto vocabulary. By Capt. F. F. W. Byng-Hall. Zungeru, 1908. Size  $6\frac{1}{2} \times 4$ , pp. 20. *Presented by the Governor of Northern Nigeria.*
- Nigeria—Southern.** **Parkinson.**  
Southern Nigeria. The Lagos province. By John Parkinson. (From the *Empire Review*, vol. 15, 1908.) Size  $9 \times 6$ , pp. 284-292.
- Nigeria—Southern.**  
Southern Nigeria. Report on the forest administration of Southern Nigeria for 1906. Colonial Reports, Miscellaneous, No. 51, 1908. Size  $9\frac{1}{2} \times 6$ , pp. 92. Price 5d.
- North-East Africa—Trade-routes.** *G.Z.* 14 (1908): 251-267, 312-327. **Kürchhoff.**  
Alte und neue Handelsstrassen und Handelsmittelpunkte an den Afrikanischen Küsten des roten Meeres und des Golfes von Aden, sowie in deren Hinterländern. Von D. Kürchhoff.
- North-West Africa.** *B. Comité Afrique française* 18 (1908): 205-216. **Bernard.**  
La frontière algero-marocaine (Région de Oujda). Rapport de mission, par Augustin Bernard. *Maps and Sections.*
- South Africa—Historical.** **Theal.**  
History of South Africa since September, 1795. By George McCall Theal. Vol. 5. London: S. Sonnenschein & Co., 1908. Size  $9 \times 5\frac{1}{2}$ , pp. xvi. and 498. Price 7s. 6d. *Presented by the Publishers.*  
This work is once more being issued in a new and revised edition, in which vols. 1 and 5 have so far appeared. The history before 1795 forms the subject of a separate series (cf. *Journal*, vol. 31, p. 554).
- Spanish Guinea.** *Rév. G. Col., R.S.G. Madrid* 5 (1908): 81-168. **Almonte.**  
Demarcación de la frontera septentrional de la Guinea Continental Española. Por Enrique d'Almonte. *Map and Illustrations.*  
Excursion effectuada en Fernando Póo. By the same. *Illustrations.*
- Togo—Cartography.** *M. Deuts. Schutzgebieten* 21 (1908): 145-149. **Sprigade.**  
Die Kartographie Togos. Zur Vollendung der Karten in 1: 200,000 und 1: 500,000. Von Paul Sprigade.
- Tripoli.** *Petermanns M.* 64 (1908): 49-57, 78-85. **Banse.**  
Das nordafrikanische Tripolis und seine Mnschia. Von Ewald Banse. *Plan.*
- West Africa.** *Z. Ges. E. Berlin* (1908): 427-431. **Frobenius.**  
Leo Frobenius' Forschungsreise in das Niger-Gebiet. I. Bericht.  
On a journey through Senegambia to Liberia and back to Bamako.

## NORTH AMERICA.

- America—Historical.** **Wieser.**  
Die Karten von Amerika in dem Isolario General des Alonso de Santa Cruz, Cosmógrafo Mayor des Kaisers Karl V. Mit dem spanischen Originaltexte und einer kritischen Einleitung herausgegeben von Franz R. v. Wieser. Festgabe des K.

u. K. Oberstkämmer-Amtes für den XVI. Internat. Amerikanisten-Kongress). Innsbruck: Wagner'schen Buchhandlung, 1908. Size 16 × 12, pp. xx. and 60; *Facsimile-maps*. Presented by Sir Clements R. Markham.

**Canada—Historical.**

**Egerton.**

A historical geography of the British Colonies. Vol. 5, Canada; part ii., Historical. By Hugh E. Egerton. Oxford: Clarendon Press, 1908. Size 7½ × 5, pp. viii. and 306. *Maps*. Price 4s. 6d. Presented by the Publishers.

**Canada—Indians.**

**Mair and MacFarlane.**

Through the Mackenzie Basin: a narrative of the Athabasca and Peace River Treaty Expedition of 1899. By Charles Mair. With . . . notes on the mammals and birds of Northern Canada. By Roderick MacFarlane. Toronto: W. Briggs, 1908. Size 9 × 6, pp. 494. *Map and Illustrations*. Presented by Roderick MacFarlane, Esq.

**Canada—Northern.**

**Chambers.**

Canada's fertile Northland: a glimpse of the enormous resources of part of the unexplored regions of the Dominion. Evidence heard before a Select Committee of the Senate of Canada during the Parliamentary Session of 1906-7, and the report based thereon. Edited by Captain Ernest J. Chambers. Ottawa: Government Printing Bureau, 1908. Size 10 × 6½, pp. 140. *Illustrations, and Maps in Separate Case*. Presented by the Minister of the Interior, Canada.

**Mexico—Archæology.**

**Batres.**

Civilización prehistórica de las Riberas del Papaloapam y Costa de Sotavento. Por Leopoldo Batres. (Pp. 6.) Exploraciones y consolidación de los monumentos arqueológicos de Teotihuacan. By the same. (Pp. 6.) Reparación y consolidación del Edificio de las Columnas en Mitla. By the same. (Pp. 8.) Mexico, 1908. Size 11 × 8. *Illustrations*. Presented by Sir Clements R. Markham.

**United States—Arizona.**

**Merrill.**

*Smithsonian Misc. Coll.* 50 (No. 178, 1908): 461-498.

The meteor crater of canyon Diablo, Arizona: its history, origin, and associated meteoric irons. By George P. Merrill. *Plans and Illustrations*.

**United States—California. Riv. G. Italiana** 15 (1908): 291-299.

**Costanzi.**

I risultati della revisione della triangolazione in California dopo il terremoto del 18 Aprile 1906. Del Ten. Giulio Costanzi. *Sketch-maps*.

**United States—California.**

**Gannett and Baldwin.**

*U.S. Geol. Surv. B.* 342 (1908): pp. 172.

Results of spirit-levelling in California, 1896 to 1907 inclusive. By S. S. Gannett and D. H. Baldwin.

**United States—Magnetism. Science** 27 (1908): 812-816.

**Bauer.**

Some results of the magnetic survey of the United States. By L. A. Bauer. *Map*.

See note in the August number (p. 188).

**United States—Meteorology. American J. Sc.** 25 (1908): 413-430.

**Bigelow.**

The relations between the meteorological elements of the United States and the solar radiation. By Frank H. Bigelow. *Diagrams*.

**United States—South-West.**

**Hough.**

Bureau of American ethnology. Bulletin 35. Antiquities of the upper Gila and Salt river valleys in Arizona and New Mexico. By Walter Hough. Washington, 1907. Size 9½ × 6, pp. 96. *Maps, Plans, and Illustrations*.

**United States—Vermont.**

**Merwin.**

*B. Museum Comp. Zoology, Harvard; Geol. Ser.* 8 (1908): 307-330.

Some late Wisconsin and Post-Wisconsin shore-lines of North-Western Vermont. By Herbert E. Merwin. *Map, Section, and Illustrations*.

**United States—Waterways. J. Franklin I.** 165 (1908): 325-344.

**Haupt.**

The waterways problem. By Lewis M. Haupt. *Illustrations*.

Cf. note in the July number (p. 89).

**United States—Wyoming.**

**Veatch.**

*U.S. Geol. Surv., Prof. Paper* No. 56 (1907): pp. vi. and 178.

Geography and geology of a portion of South-Western Wyoming, with special reference to coal and oil. By A. C. Veatch. *Maps, Sections, and Illustrations*.

## CENTRAL AND SOUTH AMERICA.

## Brazil.

Ihering.

Sammlung Göschel. Landeskunde der Republik Brasilien; Estados Unidos do Brasil. Von Br<sup>l</sup>. Rodolpho von Ihering. Leipzig: G. J. Göschel, 1908. Size 6 × 4, pp. 168. *Map and Illustrations. Price 80 pf.* Presented by the Publishers.

No. 373 of this excellent series, giving a brief outline of the geography of Brazil on a scientific basis.

## South America—Waterways.

Rodríguez del Busto.

A. Rodríguez del Busto. América del Sur: Altitudes y Canalización. Tomo I. Córdoba: Imprenta Argentina, 1908. Size 10 × 6½, pp. 238. *Presented by the Publishers.*

Discusses possible improvements in the waterways of South America.

## AUSTRALASIA AND PACIFIC ISLANDS.

## New Guinea—Dutch.

[Meijjes, Rochement, and others.]

De zuidwest Nieuw-Guinea-Expeditie 1904-5, van het Kon. Ned. Aardrijkskundig Genootschap. Leyden: E. J. Brill, 1908. Size 10 × 6, pp. xxvi and 676. *Map and Illustrations. Presented by the Netherlands Geographical Society.*

## Pacific Islands.

Rusnier.

Henri Rusnier. Le partage de l'Océanie. Paris: Vuibert et Nony, 1905. Size 10 × 6½, pp. xii and 370. *Maps and Illustrations. Price 6s.*

An historical account of the relations of European nations with the Pacific.

## POLAR REGIONS.

## Antarctic—British Expedition.

National Antarctic Expedition, 1901-1904. Meteorology. Part I. Observations at winter quarters and on sledge journeys, with discussions by various authors. Prepared under the superintendence of the Director of the Meteorological Office with the Co-operation of a committee of the Royal Society, 1908. Size 12½ × 9, pp. xiv and 548. *Maps and Illustrations. Presented by the Royal Society.*

## Antarctic—British Expedition.

National Antarctic Expedition, 1901-1904. Natural History; vol. 4. Zoology (Various Invertebrata). London: British Museum, 1908. Size 12½ × 9½, pp. iv and [282]. *Illustrations. Price 35s. Presented by the British Museum (Natural History).*

Each paper is pagged separately.

## Antarctic—British Expedition.

National Antarctic Expedition, 1901-1904. Physical observations, with discussions by various authors. London: Royal Society, 1908. Size 12½ × 9, pp. vi and 192. *Maps, Illustrations, and Diagrams. Presented by the Royal Society.*

## Antarctic—French Expedition.

Charcot and others.

Expedition Antarctique Française (1903-1905) commandée par le Dr. Jean Charcot. Sciences naturelles: Documents scientifiques. Arthropodes, par E.-L. Bouvier, H. Brölemann, Y. Carl, P. Leane, R. Du Buysson, E. Roubaud, L. G. Neumann, E. Simon, Trouessart, et I. Trägårdh; Botanique, par J. Cardot et J. Hariot; Vég. par Ch. Gravier, P. Halles, A. Railliet, et A. Henry; Mammifères pinnipèdes, Oiseaux, et Documents Embryogéniques (oiseaux et phoques), par E. L. Trouessart, A. Menegaux, et le Dr. Anthony. Paris: Masson & Cie., 1907. Size 11 × 9. *Maps and Illustrations. Presented by the Ministère de l'Instruction Publique.*

## Antarctic—German Expedition.

Drygalski.

Deutsche Südpolar-Expedition, 1901-1903. Herausgegeben von Erich von Drygalski. II. Band, Heft 3. Berlin: G. Reimer, 1908. Size 14 × 10½. *Illustrations. Presented by the Reichsamt des Innern, Berlin.*

## MATHEMATICAL GEOGRAPHY.

## Navigation.

Miremont.

Practical coastal navigation, including simple methods of finding latitude, longitude, and deviation of the compass. By Comte de Miremont. London: J. D. Potter, 1908. Size 8½ × 5½, pp. 88. *Chart and Diagrams. Price 4s. Presented by the Publisher.*

## PHYSICAL AND BIOLOGICAL GEOGRAPHY.

## Geology.

Scott.

An introduction to geology. Second edition. By Dr. William B. Scott. New York: Macmillan Co., 1907. Size  $8 \times 5\frac{1}{2}$ , pp. xxviii. and 816. *Maps and Illustrations.* Price 11s. net. *Presented by the Publishers.*

A clear and well-arranged text-book, with instructive illustrations. The first edition, which appeared ten years ago, has been carefully revised.

## Geophysics and Biogeography.

Simroth.

Die Pendulationstheorie. Von Dr. Heinrich Simroth. Leipzig: K. Grothlein, 1907. Size  $9\frac{1}{2} \times 6\frac{1}{2}$ , pp. xii. and 564. *Maps.* Price 12m. *Presented by the Publisher.*

The writer attempts to account for the facts of geological history and biological distribution by supposing a secular swinging of the Earth's axis.

## ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

## Anthropogeography.

Keltie.

Applied geography: a preliminary sketch. By Dr. J. Scott-Keltie. Second edition. London: G. Philip & Son, 1908. Size  $7\frac{1}{2} \times 5$ , pp. viii. and 200. *Maps.* Price 2s. 6d. *Presented by the Publishers.*

The book has been thoroughly revised for this edition, many sections being rewritten, and a new chapter added.

## Anthropogeography—Communications.

Ryves.

The King's Highway: the nature, purpose, and development of roads and road systems. By Reginald Ryves. London: The St. Bride's Press, [1908]. Size  $11\frac{1}{2} \times 8\frac{1}{2}$ , pp. viii. and 96. *Illustrations.* Price 5s. *Presented by the Publishers.*

A sane and judicious discussion of the road-problem.

## Commercial—Rubber.

Wickham.

On the plantation, cultivation, and curing of Para Indian rubber (*Hevea Brasiliensis*), with an account of its introduction from the West to the Eastern Tropics. By H. A. Wickham. London: K. Paul & Co., 1908. Size  $8\frac{1}{2} \times 5\frac{1}{2}$ , pp. vi. and 78. *Map and Illustrations.* Price 3s. 6d. net. *Presented by the Publishers.*

## Historical Geography.

Dann.

Historical geography on a rational basis. By Ernest W. Dann. Europe, vol. 2. London: J. M. Dent & Co., 1908. Size  $7 \times 5$ , pp. xii. and 216. *Maps.* Price 5s. *Presented by the Publishers.*

## BIOGRAPHY.

## Richardson.

Childers.

A mariner of England: an account of the career of William Richardson from cabin boy in the Merchant Service to warrant officer in the Royal Navy (1780 to 1819), as told by himself. Edited by Colonel Spencer Childers. London: J. Murray, 1908. Size  $9 \times 5\frac{1}{2}$ , pp. xvi. and 318. Price 10s. 6d. net. *Presented by the Publisher.*

## GENERAL.

## British Empire—Historical.

Lang.

Outposts of Empire. By John Lang. London: T. C. & E. C. Jack, 1908. Size  $8\frac{1}{2} \times 6$ , pp. xii. and 288. *Illustrations.* Price 6s. net. *Presented by the Publishers.*

## Educational—Practical.

Davis.

Practical exercises in physical geography. By William Morris Davis. Boston: Ginn & Co., 1908. Size  $7\frac{1}{2} \times 5\frac{1}{2}$ , pp. xii. and 148. *Illustrations and separate Atlas* (size  $8\frac{1}{2} \times 10$ ). Price 3s. 6d. *Presented by the Publishers.*

## Educational—Text-book.

Fry.

A text-book of geography. By G. Cecil Fry. London: University Tutorial Press, 1908. Size  $7 \times 5$ , pp. xx. and 406. *Maps and Diagrams.* Price 4s. 6d. *Presented by the Publishers.*

## Educational—Text-book.

Henderson.

A primer of practical geography. By J. W. Henderson. Glasgow: R. Gibson & Sons, 1908. Size  $7\frac{1}{2} \times 4\frac{1}{2}$ , pp. 124. *Maps and Diagrams.* Price 1s. 4d. *Presented by the Publishers.*

## Educational—Text-book.

Young.

A rational geography. By Ernest Young. Part iii. Scales and direction, surveying, projections. Geology, flora, and fauna. Asia, Australasia. London: G. Philip & Son, 1908. Size  $7\frac{1}{2} \times 5$ , pp. x. and 214. *Maps and Diagrams.* Price 1s. 6d. *Presented by the Publishers.*

**Geography—Text-book.****Gregory.**

Geography : structural, physical, and comparative. By J. W. Gregory. London : Blackie & Son, 1908. Size 8 x 5, pp. vii. and 306. *Maps, Illustrations, and Diagrams.* Price 6s. net. *Presented by the Publishers.*

**NEW MAPS.**By E. A. REEVES, *Map Curator, R.G.S.***EUROPE.****Austria.****Deutschen u. Oesterreichischen Alpen Verein.**

Karte der Brentagruppe. Herausgegeben von der Deutschen und Oesterreichischen Alpen Verein. Scale 1 : 25,000 or 2.5 inches to 1 stat. mile. Vienna : G. Freytag & Berndt, 1908. *Presented by the Publishers.*

This is one of a good series of maps published from time to time by the German and Austrian Alpine Club for the use of mountaineers and tourists. In style of production it resembles the sheets of the Swiss Government survey, rockwork being shown by black vertical hachuring, contour-lines at intervals of 20 metres in black and brown, and water and glaciers blue. The topographical detail is from the survey of L. Aegerter, but the depths of the Lago di Molveno and other lakes, shown by contour-lines at intervals of 10 metres, are from the soundings of Josef Damian.

**England and Wales.****Ordnance Survey.**

Sheets published by the Director-General of the Ordnance Survey, Southampton, from September 1 to 30, 1908.

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(E. Stanford, London Agent.)

**England and Wales.****Geological Survey.****6-inch maps—Uncoloured :—**

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(E. Stanford, London Agent.)

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**France.****Ministre de l'Intérieur, Paris.**

Carte de la France dressée par ordre du Ministre de l'Intérieur. Scale 1:100,000 or 1 inch to 1·6 stat. mile. Sheets: VIII.-35, St. Jean de Luz; IX.-11, Carentan; XI.-29, Bordeaux; XIV.-37, St. Giron; XVIII.-21, Nevers; XVIII.-23, St. Pourçain; XXII.-26, Lyon (sud-est); XXIII.-11, Longuyon; XXV.-32, Allos; XXVI.-33, Puget-Théniers. Paris: Ministère de l'Intérieur, Service Vicinal, 1908. Price 0.80 fr. each sheet.

These are new editions.

**ASIA.****Asia.****Cora.**

Asia a base fisica costrutta e disegnato dal Prof. Guido Cora. Scale 1:8,000,000 or 1 inch to 126·3 stat. miles. 6 sheets. Turin: G. B. Paravia e Co., [1908]. Presented by Edward Stanford, Esq.

A physical wall map of Asia, showing relief by a combination of vertical hachuring and green and brown colour tinting. The map would have been more satisfactory if fewer names had been given, for, as it is, the physical features lack clearness owing to a great extent to their being obliterated by the names. Political and ethnographical maps of Asia are given as insets.

**China.****China Inland Mission.**

Atlas of the Chinese Empire, containing separate maps of the Eighteen Provinces of China Proper and the four great Dependencies, together with an index to all the names on the maps, and a list of all Protestant Mission Stations. Specially prepared by Mr. Edward Stanford for the China Inland Mission. London: The China Inland Mission, 1908. Price 10s. 6d. net. Presented by the China Inland Mission.

To all who are interested in China from a missionary point of view, or who are concerned with the commercial development of the country, this atlas cannot fail to be of the greatest value. The maps are entirely new, and have been compiled with great care under the personal supervision of Mr. John Bolton, the well-known cartographer of Mr. Stanford's establishment, from the latest surveys, route traverses, and other available sources of information, a list of which is given in the preface written by Mr. Marshall Broomhall, the editorial secretary of the China Inland Mission. The atlas consists of separate maps, on a uniform scale of 1:3,000,000, of the eighteen provinces of China Proper, followed by maps of the four great dependencies of Sinkiang, Manchuria, Tibet, and Mongolia, on the scale of 1:7,500,000. It also contains lists of the Protestant missionary stations, and a complete index to the names in the atlas, with the province or map on which each place will be found as well as its latitude and longitude. The maps are clearly drawn and printed in colours. No attempt has been made at hill-shading, hills and mountain ranges being only indicated by their names. The vexed question of the orthography of Chinese names, which has caused delay in the publication of the atlas, has finally been settled by adopting the system of the Chinese Imperial Post Office, the stated reason for which being that conformity to that spelling would be necessary in all postal and telegraphic communications with China. The relative importance of the cities and towns is indicated on the maps by the symbols used to mark their positions, and special attention has been paid to means of communication and canals, railways opened and in progress being clearly shown. The price of the atlas, 10s. 6d., is remarkably low, considering the amount of time and labour the production has entailed.

**Persia.****Topographical Section, General Staff.**

Persian gulf and adjacent countries. Scale 1:4,055,040 or 1 inch to 64 stat. miles. London: Topographical Section, General Staff, War Office, 1908. Price 1s. 6d. net. Presented by the Director of Military Operations.

**Siam.****Royal Survey Department, Bangkok.**

Map of Muang Sritamarat. Scale 1:320,000 or 1 inch to 5 stat. miles. Map of Muangs Patalung and Sawngkla, Province of Nakawn Sritamarat. Scale 1:320,000 or 1 inch to 5 stat. miles. Map of the Province of Pattani. Scale 1:320,000 or 1 inch to 5 stat. miles. Bangkok: Royal Survey Department, 1905-07. Presented by the Director, Survey Department, Bangkok.

These are three maps based upon the latest Siamese Government surveys, and heliographically surveyed at the Royal Survey Department at Bangkok. The draughtsmanship is decidedly crude, but a considerable amount of new topographical information is to be found on the sheets.

**AFRICA.****Abyssinia.****Topographical Section, General Staff.**

Map of Abyssinia. Scale 1:3,000,000 or 1 inch to 47·3 stat. miles. London: Topographical Section, General Staff, War Office, 1908. *Price 2s. 6d. net. Presented by the Director of Military Operations.*

**Cameroons.****Topographical Section, General Staff.**

Map of the Cameroons. Scale 1:2,000,000 or 1 inch to 31·6 stat. miles. London: Topographical Section, General Staff, War Office, 1908. *Price 1s. 6d. net. Presented by the Director of Military Operations.*

**AMERICA.****Canada.****Department of the Interior, Ottawa.**

Sectional Map of Canada. Scale 1:190,080 or 1 inch to 3 stat. miles. Sheets: 18, Wood mountain, revised to June 14, 1908; 69, Moosejaw, revised to May 28, 1908; 221, Swan river, revised to May 9, 1908; 270, Pasquia, revised to June 8, 1908. Ottawa: Department of the Interior, Topographical Surveys Branch, 1908. *Presented by the Department of the Interior, Ottawa.*

**Canada.****Department of the Interior, Ottawa.**

Standard topographical map of Canada. Scale 1:250,000 or 1 inch to 3·9 stat. miles. Sheet 9 n.w., Timiskaming. Ottawa: Department of the Interior, 1908. *Presented by James White, Esq., Geographer, Department of the Interior, Ottawa.*

**Canada.****Department of the Interior, Ottawa.**

Map of the Dominion of Canada. Scale 1:6,336,000 or 1 inch to 100 stat. miles. Ottawa: Department of the Interior, 1908. *Presented by James White, Esq., Geographer, Department of the Interior, Ottawa.*

A general map of the Dominion of Canada, showing railways in operation, under construction, and proposed. The areas which it is proposed to add to Manitoba, Ontario, and Quebec are indicated by tinting. Useful tables of railway mileages are also given on the map.

**Central America.****Topographical Section, General Staff.**

Central America. Scale 1:1,705,000 or 1 inch to 26·9 stat. miles. London: Topographical Section, General Staff, War Office, 1908. *Price 2s. Presented by the Director of Military Operations.*

**CHARTS.****Admiralty Charts.****Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during August, 1908. *Presented by the Hydrographer, Admiralty.*

**New Charts.**

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**New Plans and Plans added.**

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**Charts Cancelled.**

No.		
791	Windward Islands:—St. Vincent.	New chart.
		St. Vincent and the northern part of the Grenadines . . . . . 791

No.		
631	Chile:—Smyth channel from south entrance to Fortune bay. Plan of Mayne and Gray channels on this sheet.	New chart. May and Gray channels . . . . . 3695
816	Ceylon: — Trincomali harbour and bays.	New chart. Trincomali harbour . . . . . 816
219	Malacca strait:—Acheh head to Diamond point. Plans of Lampujang strait and Prots bay on this sheet.	New chart. Plans on the north-west coast of Sumatra:— Passages between Pulo Bras and Sumatra. Lempujang strait . . . . . 3702
2760	Sumatra, west coast:—Acheh head to Chingbuk bay. Plan of Cedar and Surat passages on this sheet.	

#### Charts that have received Important Corrections.

No. 1905, England, south coast:—Southampton water. 240, England, south coast:—Hamoaze. 1777, Ireland, south coast:—Queenstown and port of Cork (outer sheet). 941b, Eastern archipelago:—Western portion, Sheet I. 2562, China:—Canton river. 1970, New Zealand, north island:—Auckland harbour. (*J. D. Potter, Agent.*)

#### Indian Ocean and Red Sea.

#### Meteorological Office.

Monthly meteorological charts of the Indian Ocean north of 15° S. lat. and Red Sea, October, 1908. London: Meteorological Office, 1908. *Price 6d. each. Presented by the Meteorological Office.*

#### North Atlantic.

#### U.S. Hydrographic Office.

Pilot chart of the North Atlantic Ocean, October, 1908. Washington: U.S. Hydrographic Office, 1908. *Presented by the U.S. Hydrographic Office.*

#### North Atlantic and Mediterranean.

#### Meteorological Office.

Monthly meteorological charts of the North Atlantic and Mediterranean, October, 1908. London: Meteorological Office, 1908. *Price 6d. each. Presented by the Meteorological Office.*

#### North Pacific.

#### U.S. Hydrographic Office.

Pilot chart of the North Pacific Ocean, October, 1908. Washington: U.S. Hydrographic Office, 1908. *Presented by the U.S. Hydrographic Office.*

#### PHOTOGRAPHS.

#### Basutoland.

#### French.

Four photographs of Basutoland, taken by Captain C. French. *Presented by Captain C. French.*

A set of 7 inches × 9 inches photographs of remarkable falls and rapids, instructive as showing the effect of erosion.

(1 and 2) The Le Bihan falls, Malutsunyane river, 630 feet high; (3) The Ketane falls, Ketane river, about 400 feet high; (4) The gorge of the Malutsunyane river below the Le Bihan falls.

#### India.

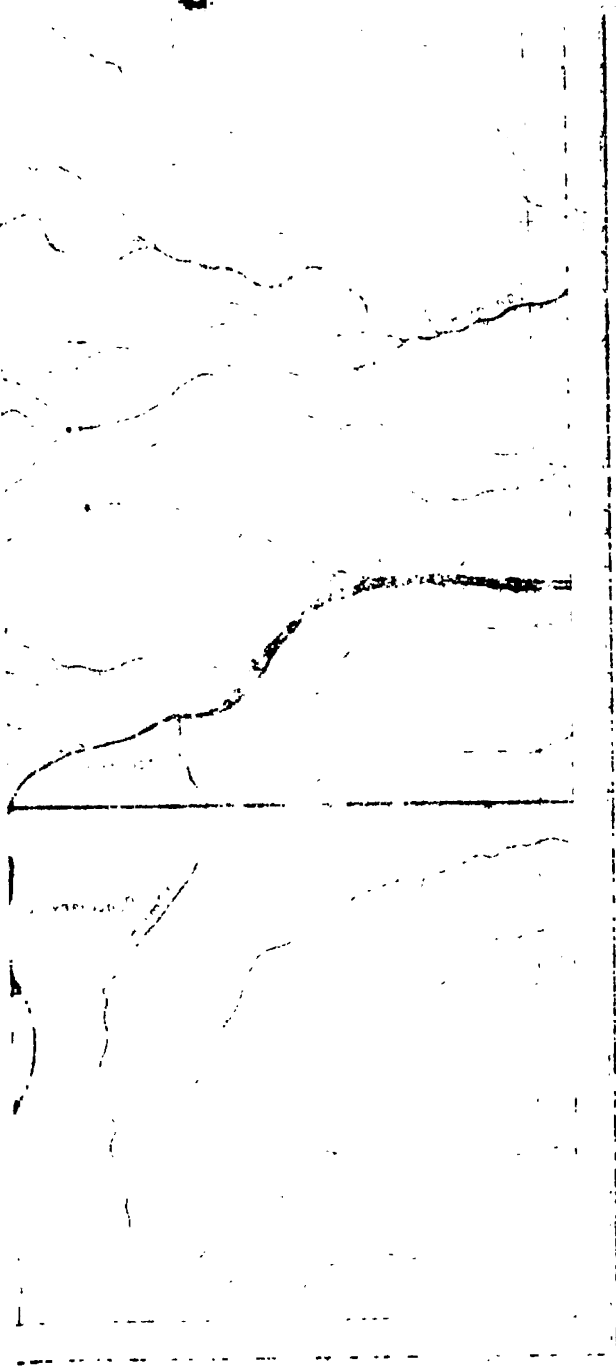
#### Varley.

Nine photographs of India, taken by F. J. Varley, Esq., M.A. *Presented by F. J. Varley, Esq., M.A.*

(1) Simla; (2) Hills north of Simla; (3) Annandale and hills to north, Simla; (4) Hills to north of Mussoorie; (5) Basin near Mussoorie; (6) A rose bush; (7) River Ganges at Hardwar; (8 and 9) River Jumna, on the Chakrata road.

**N.B.**—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.









# The Geographical Journal.

No. 6.

DECEMBER, 1908.

VOL. XXXII.

## PROBLEMS IN EXPLORATION.

### I. WESTERN ASIA.\*

By D. G. HOGARTH.

It is often said that the day of geographical discovery is drawing to its close, and, indeed, that there no longer remains any part of our globe's surface, except the circumpolar regions, where the explorer can hope to reveal important facts wholly unsuspected or unascertained. Another Alexander, he sighs for new worlds to conquer, cries for the Moon—*et sic itur ad astra!* But why should the explorer despair just yet? There lurks unseen in the world enough to last his time and, withal, his son's; and the Royal Geographical Society, which has done so much to encourage him in the past, now proposes to offer him renewed incentive by patronizing a series of summary discourses on the Still Unknown, of which the following is to be the unworthy inaugural. The explorer is perhaps suffering from nothing worse than reaction after a day of very great things. It is true that Africa is no longer the Dark Continent; but it is guarding jealously at this moment some very dark spots. Even in British territory, how much is known of the inner Shilluk districts of the Sudan, or the region between the upper waters of the Blue Nile and the limits of Uganda? And who has followed Rohlfs down the line of Senussi oases from Tripoli or the Cyrenaica towards Wadai?

We may be nearing a day of lesser things, but the day of little things is still far off. An extraordinarily small part of the land on the globe has been charted yet even by minor triangulation. Nay more, when it is borne in mind how much there is in geographical exploration, how much must be ascertained before a scientific geographical text-book can be written about a country, it may be said that any

\* Read at the Royal Geographical Society, November 2, 1908. Map, p. 648.  
No. VI.—DECEMBER, 1908.]

land not long controlled by a thoroughly enlightened and progressive nation must still be, in some respect and degree, *terra incognita*.

The particular region of the world on which I am asked to speak to-night lies comparatively near home, and, in one small part at any rate, is very familiar to us. But, nevertheless, I hope to show that it still offers every variety of field for geographical exploration. In Western Asia, by which I mean all Asia lying this side of the broad continental isthmus which divides the Black sea from the Persian gulf, we have vast areas on which no European foot is known to have trod, nor even any European eye to have looked. We have other areas, almost as large, which have been crossed always in haste, and often in fear; we have regions visited by perhaps a score of travellers since the revival of learning, but inhabited by peoples of whom we have learned much less than about the Polar Eskimo; we have others held by intricate varieties of race, the reasons of whose affinity or differentiation remain obscure; and, in short, we have a whole of which only the coasts, two tiny corners, Palestine and Sinai, and the narrow belts visible from half a dozen lines of railway and two navigable rivers, have been surveyed with anything approaching to scientific precision.

The greatest unseen area lies in Arabia, that huge peninsula which makes somewhat more than half of the whole, and in no part, out of sight of its coasts, is well enough known to geographers to be described so fully as, say, Tibet. Almost all the southern half of Arabia is occupied, according to native report, by a vast wilderness called generally *Ruba el-Khali*, i.e. Dwelling of the Void, but on its western edge *el-Ahkaf*, i.e. the Dunes, and on its eastern edge *el-Dakna*, a name given elsewhere by Arabs to a rolling gravelly steppe. No European has ever entered this immense tract, which embraces some 600,000 square miles; but three travellers, Wellsted in 1836, von Wrede in 1843, and Joseph Halévy in 1870, have claimed that they gazed on its uttermost fringes from points of vantage west, south, and east respectively. It is very doubtful, moreover, whether any native has ever crossed any part but its extreme corners, or, rather, certain tongues which it throws out towards the Persian gulf between Nejd and Oman, and towards the Indian ocean, south-west of the latter province. Some maps mark caravan-tracks running through the heart of this desert from the central Hadramaut to Maskat and Riad; but Van den Berg, a Dutch official in Java, whither colonists from Hadramaut and South Arabia generally resort in considerable numbers, wrote in 1885, after much questioning of the Javanese Arabs, that none whom he had met knew anything of the Ruba el-Khali but its name; and that, according to his information, there was no direct communication at all between the Hadramaut and either the Wahabi country of Nejd or Maskat. Travellers overland from Yemen to Oman make a long *détour* into south Nejd and thence cut across to Bireima in about fifteen stages, of

which eleven are waterless. For the rest, we have only very vague reports recorded at second hand by explorers like Palgrave and Burton (who themselves never approached within some hundreds of miles of the Ruba el-Khali) to the effect that there is some oasis life of a very primitive kind and some possibility of travelling in the awful waste. The latter explorer thought it might perhaps be crossed in early spring with she-camels giving full milk. But it will take a bold man to venture out for the passage of either 850 miles west to east, or 650 north to south in the isothermal zone of the world's greatest heat, with no better information than we possess. Perhaps some air-pilot in the far future will be the first to try. One cannot reasonably urge this enterprise on any explorer. Arabia is everywhere a lean land at best, and there is little doubt it is at its leanest in the Ruba el-Khali. There is, in all likelihood, very little to see from one end to another but sand, gravel, naked outcrops of rock, wind-carvings of the friable surface, and here and there a group of wild palms. Still, who can say for certain? Here is a region as vast as the circumpolar sanctuary, and as little seen. It must receive some precipitation from the monsoons which affect the districts east, south, and north. It does receive drainage from the Oman mountains and the wadys of Nejran. It has been reported to contain black Bedawis and tracts of palms. It may be ranged by a curious drinkless fauna like the northern Arabian desert, the Nefûd. It may hide anything you like to imagine in its secret area, three times the size of these islands of ours. We know just as much or as little of it as the Moslem geographers knew in the Middle Ages—and that is all!

About its fringes, however, lie districts, also unvisited, which we may hope will be explored some day. The biggest feat left for a traveller to perform in Arabia—perhaps in all Asia—is to get across the Yemen, follow Halévy up to Nejran, and pass thence beyond his farthest up the long Wady Dauasir to Aflaj and High Nejd, whose southernmost provinces, Harik and Yemama, of ancient fame for their waters and comparative fertility, have never been seen by Western eyes. This route is, we know, travelled by caravans. The first part of it, in the Wady Dauasir, as Doughty was informed by a man of the Kahtan, lies through a long palm tract for over 100 miles of march. There are plenty of wells, and the Arabs are not inhospitable to travellers conducted by one of their own kin. Aflaj is an irrigated district, and southern Nejd is a grazing and garden country. There are, it is known, important urban centres in it, particularly Kharj and Hauta, and it seems to be the chief breeding-place of the Nejdean horse. The fortunate explorer will have very important hydrographic and orographic problems to solve. He ought to determine at last what becomes of the inland-flowing waters of west central Arabia, such as the Nejran wady streams seen by Halévy; and whether the limestone

ranges of southern Nejd are or are not connected with the Red Sea coastal highlands. He may be able to revisit, or at least report at second hand upon, that mysterious valley region of Yabrin, which Moslems in the Middle Ages heard of as lying on the north central fringe of the Great Desert, and containing half-buried cities, among whose ruins the Bedawis found coins. He should learn much about the mysterious Kahtan Arabs and their possible African origin. He will be in a position to tell us whence the energy and power of the originators of the Wahabi movement were derived. All this, of course, if he comes back. It is a serious reservation. Under present conditions the western explorer is not wanted in Nejd, and he may find it easier to get in than out, except to another world by short shrift of club or spear. He will have to face or elude not only religious fanatics of the extreme type, but a whole population dependent on slave-labour, and accustomed for generations to regard Western men, and especially Britons, as destroyers of the means to social wealth. The device of disguise one never likes to recommend. Like an *alibi*, the worst of all defences if unsuccessful, it almost certainly entails speedy death. A man might go, as did Halévy, in the modified disguise of an itinerant Rabbi, and be forwarded by co-religionists of Nejran. But that venture needs moral, as well as physical, fortitude of no common order; for, in addition to the peril of one's real character being discovered, the severe hardships and indignities incidental to the assumed one have to be endured. Halévy was kicked from pillar to post through Yemen and Marib. You might go as Doughty did through northern Nejd, as a poor Christian *hakim*, begging your way from well to well and camp to camp; but the risk would be very great, and the opportunities for doing scientific work under such conditions but small. You might go *en prince*, as did Nolde to the Emir of Hail in 1893; but then only by grace of the Turks at the start from Yemen, and in the strength of your own right arm beyond. Probably an explorer must wait till some favourable political conjunction occurs—if ever by chance the restoration of our paramount influence at Constantinople should coincide with overtures made, as in 1865, by the Wahabi power in south Nejd to the British power in the Gulf. Then he should try his luck openly in his true character, as a person of quality visiting other persons of quality, carrying instruments and notebook, as even Doughty did, not abjuring his Christianity—for this will serve him with the ragged aristocrats of the camps—and healing the sick as he goes. But he had better make his will before he starts, or, better still, be a friendless orphan with no will to make.

There remains also to be accomplished a much shorter and perhaps less hazardous journey through the unknown round the south-western angle of the Great Desert. Starting from Aden or from Yemen, an explorer must try to get to the headwaters of the great Hadramaut wady and follow it down to its mouth on the Indian ocean. Only in

mid-route will he find tracks of previous travellers, of von Wrede, of Hirsch, and of Bent, who all went up to Central Hadramaut direct from the southern sea, and returned as they had come. It would add much to the value of this journey if it were made in its first part through Marib, the old centre of the Sabæan power in the Yemen *hinterland*; for despite the visits of Arnaud, Halévy, and Glaser, we still remain very ignorant of that land of ruins and inscriptions, watered by huge irrigation systems and traversed by a Roman army in the time of Augustus, but now lapsed to semi-nomadism. For one thing, no photographs have ever been published of the ruins and of the great broken dam at the Sabæan capital. There is, however, at this moment, a project afoot for a certain bold explorer, who has had unique experience of the Aden *hinterland*, to attempt further exploration in and about the Great Desert. It will be a great day for this Society if, thanks to its support, even a corner should presently be lifted of that vast South Arabian veil.

Northern Arabia is in another geographical category. We can be fairly sure that there is no sensational secret to be learned about it in the purely physical field. Of course, it is almost all wholly unsurveyed in any scientific sense of that word, and we cannot chart, except by the roughest approximation, its lines of heights or its lines of drainage. But it is, as I have said, a very lean land, and largely of a very uniform surface, whose outstanding features are half-obliterated by wind-erosion and sand-drift—a land which has no permanent streams and is terribly naked. Whoso has seen in any part its soft desert, its gravelly steppe, its sand-bottomed and rock-walled wadys, its low pans where palms can live, and its high volcanic *harra* tracts of corrugated lavas, has virtually seen them in every part. The geology is very imperfectly known; but perhaps the most virgin field for an explorer lies in its ethnography, and especially its anthropology and political grouping. No European is known to have been in any part of Nejd since 1893, when Nolde rode from the north to Kasim and back, and none in south Nejd since 1865. It would be most interesting to have a scientific report at first hand on the present state of the Wahabis; on the political relations of the northern and southern sections, led by the emirs of Hail and Riad respectively; and on the relations of both to the great Bedawi tribes, and to the Ottoman administration which is established in the coastal districts on either hand, and is for ever trying to make good a footing in the centre. But that would not be altogether a geographer's report. Nor is there much to do in Hejaz except in the departments of pure cartography and political geography. To effect much in the first department would be almost impossible under the peculiar political and religious circumstances of the province, unless one happened to be an engineer on the Hejaz railway. Hitherto the small European

element employed in the direction and construction of this remarkable line—perhaps the most remarkable piece of railway pioneering of our time—has been exclusively German. Since, however, the star of Great Britain seems to be in the ascendant once more in Constantinople, we may possibly be admitted to equality in the future. But the rail-head is now far within the borders of the Holy Land, and, indeed, advanced to the southward of Medina itself; and it remains to be seen what policy will be prescribed in the future by Ottoman respect for local Moslem prejudice, backed as it will be by Moslem feeling throughout Asia and Africa. If a compromise has been come to about Medina, where the railway station has been built a long way without the city, and Christian engineers and the like will, as in the days of the Egyptian occupation, be restricted for a long time to come to the suburb, there will be less difficulty about Mecca, which has always been the less exclusive of the *Haramain*. We need much more information about both the mountainous country between Medina and Mecca, and also that lying south of the latter town. Indeed, a journey from Taif southwards to Yemen either by the coastal district of Asir, or farther inland by Taraba and Wady Bishe, is almost as much worth an explorer's risk as any in Arabia. But the making of any more European pilgrimages to Mecca is geographically of little use. Since Snouck Hurgronje's residence in the Holy City for five months in 1885, Mecca has become as well known to us as, say, Sanaa, the capital of Yemen. We have abundant topographical and social detail concerning it, and photographs of its streets, its mosques, its Holy of Holies, and its neighbourhood. Scores of Moslems, especially Indians, with a more or less European education, go there now, and some write accounts of their visits. There is even now and again a pilgrim of Western nationality, who has become a genuine Moslem. An American, I believe, accompanied the *haj* this last time with his family. To repeat Burton's exploit in these days, therefore, would be to effect a mere *coup de théâtre*. We can learn all we want about Mecca without giving further offence to Mohammedan feeling by masquerading in disguise.

In the mean time, a very considerable advance in our knowledge of north-western Arabia has, in fact, resulted from the making of the Hejaz railway, as may be judged by any one who will take the trouble to read the two admirable papers by General Äuler, published as *Ergänzungshefte* of *Petermanns Mittheilungen*. In the latest, which appeared this past summer, the general, who is in the Ottoman service, and was commissioned by the Sultan to survey the completed line as far as El-Ala, carries his description up to the frontier of the Holy Province, and adds some information about the country to southward, derived from the reports of Turkish engineers. The track runs along the depression behind the great lava-capped masses which form the culminating heights of the Red sea highlands, and tower in places

to some 10,000 feet. General Auler observed carefully the superficial geology and features of landscape, and he adds much to what we had already learned from the only previous visitor with geological knowledge, namely Doughty. But for my present purpose it is more necessary to emphasize the fact that his information is confined to a very narrow strip, than to describe that strip itself at second hand. There remains plenty for explorers to do for some time to come on either hand of the line, and particularly in the mountainous and most difficult region which lies between the central section of it and the Red sea. This has been crossed, to my knowledge, only by one European. This was Julius Euting, on his way from el-Ala to el-Wij in 1884. But he was flying for his life most of the way after an encounter with the Jeheina Bedawis, and saw even less of the country than did Doughty when he went wandering with the Moahib tents on the Harra west of the Medain Salih valley in 1877.

It is a long time since any one has described in any detail the littoral districts of the Persian gulf north of Oman. In Hasa, outside the oases which contain the large urban centres of Hofuf and Mubarriz, it is evident that the ordinary thin steppe and desert conditions, with ordinary thin nomadic life, prevail; and the same appears to be true of all Katr. But it is much to be desired that some ethnologist should make a study of the mountainous region between Katr and Oman, which runs out into the gulf as the immense headland of Ras Musundam. There is reported the survival of a small Negrito race, prior in origin to the Semitic stock of Arabia, which leads a semi-troglodyte life in the hollows of the Cape. Unfortunately, this is more or less the domain of the so-called Trucial Chiefs of the Gulf, that is of tribal *sheikhs* of piratical tradition and habit, who have been forced by our patrolling cruisers and gunboats to expend their bellicose energies in internecine warfare on land instead of raiding the pearl fleets of Bahrein, and running slave cargoes as of old. The agreement implies, on our part, abstention from landing; and therefore, though British ships are for ever off this coast, they seldom communicate with it, and still more seldom put any one ashore. There is a very interesting and compact piece of geographical work to be done on Ras Musundam, which would make a minor reputation for a bold and hardy explorer.

So much for Arabia proper, on the whole the most virgin, though perhaps not the most promising, field for exploration in the continent of Asia. The geographical conditions of its upper half extend far to north of the actual peninsula, or "Island of the Arabs," as Moslem authors have named it; and our knowledge or our ignorance of the Syrian *Hamad*, or hard desert, continues about the same as of North Nejd up to the latitude of Tadmor or Palmyra. This is to say, explorers have crossed it on a few lines, riding fast from well to well, always moving on for fear of Bedawi raiding parties, finding tents and herds

of the various tribes of the great Anazeh family scattered over its face, but no permanent settlements except certain well-known ones on the fringes, of which the chief are in the southern oasis of Jauf. Recently, in the spring of this year, a new line has been explored by two British officers, who, starting from Baghdad, followed a series of wells along the north edge of the Nefud to Jauf. Their report will be given this session to the Society.

On the western fringe of the Hamad, in that innermost country beyond Jordan which was once the eastern *hinterland* of Moab, Ammon, and Bashan, the investigator of ancient geography and antiquities has still something to do. The splendid volumes issued by Brünnow and Domaszewski on the Roman province of Arabia (i.e. Arabia Petrea), and the accounts published still more recently by Dr. Alois Musil on Moab, and by Miss Gertrude Bell on the Hauran, cover fairly well the main part of the trans-Jordanic districts, and fill up large blanks left by the Palestine Survey. But it is evident from their descriptions that settled life existed anciently on spots still further east, and that a profitable exploration remains to be done in the Hamad itself beyond the Wady Sirhan and below the eastward slope of Jebel Hauran. The same might indeed be said of all eastern Syria on the edge of the desert, even north of Damascus. The Princeton expedition, led by Mr. Howard Butler, opened to our view four years ago quite a new land of deserted towns and villages lying forgotten east of the Orontes basin; and the whole triangle, whose base runs from Homs to Der el-Zor while its apex reaches almost to Aleppo, is still imperfectly known from any point of view. It is ranged by the Anazeh tribes, who find here, under the influence of the Mediterranean rain-clouds and within the fringe of the Tauric precipitation, their best summer grazing-grounds, and tend more and more, under Ottoman pressure, to adopt settled life. They have, indeed, established considerable permanent villages, almost towns, e.g. at Resáfa, in the upper part of the triangle. The district, therefore, is becoming gradually less dangerous than it used to be, and, except on rare occasions of strife between the Ottoman Government and the Anazeh or the Hauran Druses, is no longer subject to Arab raids.

How marked a change has taken place in north Syria during the reigns of the last three sultans may be estimated by any one who compares the descriptions penned by European residents in Aleppo in the earlier part of the nineteenth century, and by the officers of our Euphrates Expedition, with the present state of the country. Consul Barker used to ride but an hour or two out of Aleppo to hunt with Bedawi sheikhs, and Chesney and Ainsworth met with none but wandering Arabs south of Birejik. I passed last spring from Aleppo to Mumbij and the middle Euphrates, finding the whole land seamed by the plough and dotted with villages. Mumbij, the ancient Hierapolis-Bambyce, where Chesney and his men saw only a few nomads who had stacked their

weapons in a deserted tomb, is now a large Circassian township, the centre of an imperial estate worked by peasants living in over one hundred and fifty villages. Carriages were running from Aleppo to Baghdad by way of Meskinah and the right bank of Euphrates, and from Aleppo to Seruj, Urfa, and Mosul by way of Mumbij and the old crossing of the great river near the Sajur mouth—a route abandoned for centuries till two or three years ago. The Turk may be (or, shall we say now, may have been?) a bad ruler of settled lands, but he settles the unsettled. Like his religion, he can improve the worst, if he does not make the best. At any rate, he can make and maintain some sort of civilization where the Arab, it must be confessed, when left to himself, seems to produce nothing better than barbarism.

I have well-nigh exhausted the parts of Western Asia where geographical exploration, in all its departments, has still a very wide field. There remain, perhaps, central Mesopotamia, a rolling down country, not unlike the Syrian Hamad, very featureless and given up to nomadism, which certainly hides no secret of importance, and has been traversed in considerable part of late by that indefatigable explorer, Major Mark Sykes; and the wild disturbed mountain ranges of the southern Turco-Persian frontier, the fastnesses of the Bakhtiari, and the Lurs, visited by many travellers since Layard's day, and for all the dangerous turbulence of their inhabitants, comparatively well known. There remain also, certainly, the tangled mountains of Kurdistan, recently explored anew in divers parts by Lord Percy and Colonel Maunsell; but not quite in all parts. I would call especial attention to two Kurdish districts which, on account of their insecurity, are yet virgin. The first is comparatively small, about 50 miles square, situated in the southern part of the wild mountainous region of Hakkari, and south of the great culminating group of Alpine peaks, which are called the Jelu and Sat Dagh. The highest summits of these, such as Galiashin in the Jelu, have never been ascended. They used to be reckoned over 17,000 feet in height, but these estimates have been reduced by Colonel Maunsell, and probably the highest point, that of the Sat Dagh, does not reach 15,000 feet. None the less, the traveller here sees perpetual snow, and even permanent glaciers, though of small size. Thence to the junction of the Bradost river with the Zab roll downward, in ever-decreasing folds, long open ranges, which are the summer haunts of the Apenshai and Dustik Kurds; and these, so far as I am aware, no one has yet penetrated beyond the central village of Oramar, visited for a single night by Lord Percy in 1899. To see and to survey this square of 50 miles, and to visit the dangerous Kurdish districts lying on and east of the Persian border, between Rowanduz and the southern end of the Urmi lake, would evidently be still worth a traveller's while.

The other district to which I wish to direct attention lies in the

extreme north-west of what is roughly understood as Kurdistan. It is that "Swiss" region (as Colonel Maunsell has named it) of the Dersim, enclosed between the two main branches of the Euphrates, and containing the Alpine mass of the Muzur Dag. This is a larger district than the first, measuring some 100 miles from east to west by about half as much in breadth. We have no description of any part of its central highlands except along the line of a military road which bisects it from south to north between Palu and Kemakh. I believe that more than one of our consuls at Erzerum has made a short excursion into its outskirts to visit friendly chiefs; and several travellers—for instance, Colonel Maunsell and Major Sykes—have skirted it on the south, touching the inhospitable border settlements of its southernmost tribe, the Siphani Kurds. I myself have seen its peaks from the west and north, but nothing more. It is known to be held by a group of tribes which have never acknowledged Ottoman authority, and quite recently were in open strife with it; and these tribes are all spoken of as *Kizil-bash*, i.e. "Red-heads," a name given by Turks to peoples whom they regard as practically pagan. Wherever one encounters that name one may be sure of one thing—that the group so designated belongs, at any rate, rather to the Shiah than the Sunni section of Moslems. Sometimes it can be proved to be of comparatively recent Persian extraction; more often the reason of its continued existence in the territory of the Sunnite half of Islam is lost in obscurity, and seems only to be accounted for on the theory of isolated survivals of pre-Islamic Incarnationist groups, such as are found still in the west Syrian mountains, in Jebel Sinjar in Mesopotamia, and in southern Kurdistan. The Dersimlis, at least, are said locally to believe in incarnation, and to be more in sympathy with the Armenian Christians than with the Osmanlis. Indeed, they have been said to be actually crypto-Christians of Armenian blood. One cannot but suspect that they are really more or less Manichæans; for the historical centre of that heretical faith lies just across Euphrates and in sight of the Dersim hills, at Divrik, the ancient Tephrike.

To investigate the problems of Dersimli race and creed, to survey the unvisited valleys and peaks of the Muzur Dag and its eastward continuation, and, last but not least, to find cuneiform memorials of the old Vannic kingdom, rumours of whose existence in the Dersim were brought to me in the neighbourhood in 1894—these objects offer a very promising bit of exploration to a bold traveller, prepared to leave at the foot of the hills the escort with which he will have been provided at Erzinjan, and to throw himself on the hospitality of chiefs who, I was told, are particularly well disposed towards our race. It says much for English-speaking travellers and missionaries that, on the whole, Europeans are so well received in Kurdistan. For Britons and Americans have almost monopolized the exploration of that land.

Kurdistan is a mountainous region from end to end, and so also are Luristan and Bakhtiari Land—mountainous regions, moreover, inhabited by wild and suspicious tribes, partially controlled at best by external imperfect governments, and more often under no government but their own. In such it need hardly be said that, whatever be the case with the lower valleys, the higher ones and the mountain summits remain, in nine cases out of ten, unvisited. To the best of my knowledge, not half a dozen of the highest mountains in the regions mentioned have been made the object of ascents—Ararat, for example, on several occasions, and the two great volcanic peaks, Sipan and Nimrud, which overlook the Lake of Van, and also Mount Galianu in the Jelu group. There remain hundreds of lofty summits, and below them thousands of lofty valleys, in this immense mountain region, which no European foot has yet trod. It is not possible within the limits of this paper to specify these. The two Kurdish districts, which I have mentioned above, are only the most important among several areas which might have been coloured on this map in the lightest tint. Even in the plain regions of Syria and Mesopotamia, also, there are unvisited areas. For examples one may quote much of the rolling down country between the Koweik and the Sajur north-east of Aleppo; or that between the Euphrates and its left-bank affluent, the Belik. But enough is known about the immediate environment of such unvisited areas for their general character to be no longer doubtful. They could be defined accurately only on a very large-scale map made by careful comparison of the material in the possession of the best British and foreign cartographers and the military authorities. Such a map would be a costly undertaking, but very useful.

How often and minutely a country may be explored, but yet, if it be not under a government of the European type, how little visited its mountains will remain, may be illustrated from yet another region in Western Asia, namely, Asia Minor. This region has been most patiently surveyed for its antiquities by expeditions of all nationalities during something more than a century, but archæologists have only just bethought themselves that they have neglected, from first to last, those most likely places, the hill-tops. We ought to have taken warning earlier from the case of the Nimrud Dagh, a great southern bastion of the Taurus thrown forward where the Euphrates emerges from the mountains near Kiakhta; for there, some twenty years ago, explorers were induced by shepherds' reports to ascend to the summit, and find a great monument of one of the kings of Commagene, surrounded by colossal statues seated in the snow. But it is only in the past two years that the discoveries made by Miss Gertrude Bell of a Hittite inscription near the summit of the Kara Dagh south of Konia, and of remains of sanctuaries on the Karaja Dagh and the volcanic Hassan Dagh some 80 miles distant to north-east, have

suggested to scholars a wholly new field of exploration in Asia Minor. The little windy chapels which stand as near heaven as may be on almost every peak in Greece evidently had predecessors on the summits of West Asian hills as far back as Hittite times; and the sooner we go back to Asia Minor in all humility and climb the peaks we have been wont to ride round or beside, the better. Even the very few conspicuous peaks already ascended in times past, such, for example, as the great extinct volcano of Erjies, which towers over Kaisariyeh to a greater height than any other summit in the peninsula, ought to be climbed again, now that we know better what to seek. The future mountaineer in Asia Minor should make many discoveries which will interest others than archaeologists. Highland valleys and afforested slopes are everywhere the refuge of survivals of old broken races, and in Asia Minor particularly of the little-known Takhtajis, to whom von Luschan has devoted so much study, and of the various Kizil-bash groups.

The districts in the peninsula which need most this sort of Alpine exploration are, first, the highlands of Lycia, a tremendous ganglion of the Tauric system where many summits overtop the 10,000-feet line, and the slopes and valleys are densely wooded; secondly, that lofty part of the spine of Taurus, known as Bulgar Dagħ, near the Cilician Gates, and the still higher offshoot sent thence northwards and called the Ala Dagħ; thirdly, the isolated systems which start rather suddenly out of the tableland of central Phrygia and Cappadocia over a wide area from Sultan Dagħ, west of Aksheher, to Yildiz Dagħ, north of Sivas; and lastly, the magnificent Lazi ranges east of Trebizond. There are many others no better known, though nearer to centres of civilization, such, for instance, as the Boz Dagħ, the ancient Tmolus, of wide and evil fame for brigands, which rises almost in sight of Smyrna. In general, one can only say that there are very few conspicuous hills in all Asia Minor of which ascents have been recorded, and of which ascents would not be well worth the making.

Apart from groups of mountains whose upper valleys are unexplored, there remain at least three districts in Asia Minor very imperfectly known. These are, first, the valley of the Euphrates for about 50 miles of its course from the point where it enters the main chain of Taurus at Kumur Khan to the point where, after passing through tremendous gorges by a series of rapids, it comes more or less into the open again at Gerger. This tumultuous part of its course, during which it falls about 20 feet a mile, has been navigated on *kelleks*, or skin-buoyed rafts, first by von Moltke in 1839, and more lately by an American explorer, Mr. Ellsworth Huntington. But to be whirled down in this fashion at imminent risk of disaster in every rapid is not to explore the main valley, still less the lateral valleys, and the accomplishment of these hazardous passages has not added much to our knowledge of what lies on the shore. To follow either bank

continuously appears to be impossible; but to make descents from point to point down the tributary valleys on both banks would be a useful, if toilsome, piece of exploration, for which students of the Roman frontier defences, who wish to know how the Euphratean lines ran between the camp of the Tenth Legion at Melitene and that of the Sixteenth at Samosata, would be peculiarly grateful. It should be coupled with a survey of the Tauric chain west of the right bank, carried back as far as the oblique pass through which runs the high-road from Malatia to Marash; for this part contains ill-known passes, and a very interesting Kurdish society still in a semi-pagan state.

The second obscure district lies in the heart of Asia Minor in the ancient Cappadocia, and embraces the hilly country round which the river Halys finds its way north, after it has come south-west nearly to Kaisariyeh. This block of country, roughly about 100 miles square, and interposed between Sivas and Yuzgad on the east and west, and Zile (Zela) and the elbow of the Halys on north and south, was first pointed out to me as a field for exploration by the late Sir Charles Wilson many years ago. He said that it contained an interesting and little-known Kizil-bash population, and he prophesied that many interesting monuments of antiquity would be found in it. His foresight has been signally illustrated by the recent discoveries of a colossal "Hittite" eagle in stone and of a four-sided monument with long Hittite inscription, on two deserted sites on the south-western edge of the district. Regard being had to its proximity to the great northern Hittite capital, now being excavated at Boghaz Keui by the German Archæological Society, and to its intermediate situation between this city and the Cataonian district which is full of monuments of the same prehistoric civilization, its further exploration will be awaited with keen interest.

The third district embraces the upper valleys of both the southern and northern branches of the Gyuk Su, the ancient Calycadnus, in the central south of the peninsula. This is both smaller in extent than the preceding district and less promising. The explorer should enter from Alaya on the Gulf of Adalia, make his way to Ermenek, ascend the southern valley, cross to the northern, and descend this to Selefke at the mouth of the united stream. He will pass through a very beautiful upland country, mostly unvisited, inhabited largely by a semi-nomadic population, and probably full of ancient remains.

In all the districts of Asia Minor, at a distance from railways and the larger seaports, there is much cartographical material still to be collected. Every traveller who penetrates inland finds that the latest maps constantly mislead him in such respects as the relative position of villages to one another and to streams. For example, I was twice led, in 1894, by the latest map of Eastern Asia Minor to steer for a village on my own side of an unfordable and unbridged river, only to gaze on it illumined by the sunset on the farther bank. Made

as the map of all inland Asiatic Turkey, except part of Syria and Sinai, has been in the main from rapid route surveys, which often started from, and ended at, points not astronomically fixed, and were seldom tied in one to another, its specious appearance of precision should not discourage travellers from continuously recording topographical notes wherever they may be on the plateau, out of sight of the two or three railway lines. I do not suggest that they try to make exact charts with theodolite or even plane-table themselves. That is no more permitted to a stranger in Asia Minor than on the continent of Europe. The Turk is a jealous ruler and a fairly vigilant one, and the suspicions of his local officers make them prompt to take fright at the sight of surveying plant. Usually one can use nothing more elaborate than a prismatic compass in the more civilized districts, and hope to do no better than check dead reckoning by a few traverses. The one important exception to the Ottoman policy of excluding map-makers has been made, of course, in Palestine, where British diplomacy secured exceptional facilities at a moment of British ascendancy by pleading the peculiar religious interest of the country and the needs of pious wayfarers. Expeditions, also, sent expressly to open ways of communication which would be of advantage to the Government have, of course, not been hindered from surveying the lines proposed. Thus we have fairly exact charts of the middle and lower course of the Euphrates made by Chesney's engineers in the thirties, of the lower courses of the Tigris and Karun, and of the Shatt el-Arab; also of the divers trunk railways and their immediate vicinity. When the chart of the Hejaz line can be utilized, it will make a long base for future surveys in western Arabia, and the Baghdad railway will ultimately give us a diagonal measured line across almost all Asiatic Turkey. The chart of its proposed route, however, beyond the present rail-head at Bulgurli, north of Taurus, is not yet available.

What is true of all inland Asia Minor is true of nearly all the rest of Asiatic Turkey—the best existing maps need everywhere verification, and filling in, and can almost always be amended even by the very summary methods open to the mere traveller. If he restrict himself to a comparatively small district and traverse this repeatedly in various directions, he will, of course, do better cartographical service than if he add but another to our large stock of more or less disconnected route-lines. A good example of the value of such localized work is supplied in the first instalment of Dr. Alois Musil's recent 'Arabia Petrea.' With German foresight and thoroughness this archæologist had himself trained in surveying before he went afield, and was enabled to add to science not only the knowledge of the great ruins of Kuseir el-Amra, but also a very much improved map of Moab. I myself saw last spring another very accessible and easy field for such work. The whole district between Aleppo and the Euphrates, extending north to the Sajur river

and south to the edge of the Desert, is left almost as blank on Kiepert's latest map as the Desert itself. A few caravan tracks are drawn through it with those unwavering lines which suggest either a perfectly flat and featureless plain country, or the perfectly plain ignorance of an uncompromising cartographer. A very few village names and wells occur, usually written simply "Dorf," with an added note of query if off the tracks, and at suspiciously equal intervals if on them. I started from Aleppo for Bab, seven hours away, and during even that short journey learned, to begin with, that there were three times more villages in sight than were marked on the map, and that Bab itself was considerably further distant and more to the north than the cartographer had placed it. Thence I expected to jump off into an almost uninhabited steppe, with 20 miles to cover as far as a solitary midway station called Arimeh, and 20 more to Mumbij. I had the pleasant surprise of finding that each of those stages reduced itself to about two-thirds of the cartographer's distance, and that there was quite an embarrassing choice of villages all along the way, lying in rich ploughed lands. When later I covered the further road from Mumbij to Kalat en-Nejm on the Euphrates, I passed six villages on a road where only one is marked, and that does not exist. Any one armed with Kiepert's map, a prismatic compass, and a reliable watch, who will spend even a month in going to and fro between Aleppo, the Sajur, and the Euphrates, can fill hundreds of names and features into a cartographic blank, which is in reality as well populated and fertile as any region in Syria.

This, then, there is for an explorer to do even in so near a region as Western Asia. Almost everywhere he may add important details to maps very imperfectly filled in. His most accessible and remunerative fields will be in Eastern Asia Minor and North Syria. In the mountainous districts of Asia Minor, Syria, Armenia, Kurdistan, and Western Persia, he will find also abundant ethnographic and economic work to do, especially in the observation of tribal grouping and custom, and of natural products. Throughout the great desert tracts, which make fully a third of the whole area, he will find it the easiest thing in the world to avoid the tracks of any European predecessor, and to see nomadic populations to which Western guests have never come. In Southern Arabia, if he have a stout heart, he may yet make more than one journey which offers not less of the unknown, not less long detachment from Western civilization, and withal not less personal peril, than were sought and found by the greatest pioneers of the past.

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Before the paper, the PRESIDENT: The lecture of the evening is to be one of a series describing the unexplored parts of the world. I think you will not be surprised when I say it is probable that some of these lectures cannot be read at

our evening meetings, but will appear printed in our *Journal*. We hope in this way to obtain a very valuable series of articles, describing what remains to be done in the world in the way of exploration. It is, I believe, fourteen years since Mr. Hogarth lectured here, and possibly to some of us he wants reintroduction. But to those who have served on the Council and know the valuable aid he has given to us, he needs no introduction. He is a master of archaeological exploration in Egypt and in Greece, and he knows a great deal about the localities which he is going to discuss to-night, and I will therefore not do any more than call upon him to deliver his lecture.

Sir THOMAS HOLDICH: I very much regret that my old friend, Colonel Wahab, is not here to-night to make his own remarks. They are not long, but you will see at once that in the main they bear out exactly those principles we have just heard from Mr. Hogarth. Colonel Wahab was engaged for some years in the delimitation of the boundary to the north of Aden, and since that very troublesome boundary has been settled, he has occupied himself in a very close examination of the questions which are before us to-night—the possibilities that may occur for further exploration in Arabia. And this is what he has to say about it—

Colonel WAHAB: "All who have travelled in, or studied the geography of, Arabia will be grateful to the lecturer for bringing the subject of its unexplored wastes before the Society. Throughout northern Arabia, that is north of a line from Jidda, passing through Taif and across Nijd to Hofuf and the gulf, the peninsula has been crossed and recrossed at intervals sufficiently close to enable us to form a fair idea of its general character. South of this line no trade or pilgrim route crosses it; few Europeans have penetrated more than 100 miles in a direct line from the coast, and these have found their way barred by the sands of the Dahna. On the east and south coasts the strip between this desert and the sea has been explored, first by the Indian Marine surveyors and more recently by Zwemer in Oman, and by Hirsch and Bent in Hadramaut; on the west Glaser and Halevy, both skilled archæologists, reached the western edge of the desert and explored the seats of ancient Sabæan and Minæan civilization in Marib and Nejran, leaving little to be discovered by travellers under present conditions. Omitting the half-million square miles of the Dahna desert as unprofitable waste, there still remain the northern districts of Yemen, the whole of the Asir highlands, and the hinterland extending north-east to the borders of Al Hasa as a field for the geographical explorer. A route from Saná northwards to Taif would lead through one of the most interesting districts of Arabia, of which nothing is known at first hand, except from the meagre accounts given by Tamisier and other French officers of Mehemet Ali's army between 1830 and 1840. A journey through Asir and down the Wadi Dawasir to Yemáma would indeed be, as the lecturer describes it, the biggest feat left for a traveller to perform in Asia. All we know of the hydrography of this vast area is that the *wadis* of Asir, and perhaps of Nejran, drain to the north-east; but whether they unite to form the W. Dawasir, or some of them form a separate and southerly *wadi* system draining by the Wadi Yabrin to the Khor ad Duwan, or the salt marshes east of it, we cannot say.

"The difficulties and risks of such a journey are serious. The whole Red sea coast is Turkish, and British subjects have not, of late years, found travelling in Turkish possessions a safe or easy matter. The independent tribes in the interior of Asia and Northern Yemen are somewhat fanatical followers of the Imám, whose capital Sada lies in the direct road north from Sana. The British authorities would forbid any one entering from the Aden district. The only approach to this hinterland would therefore seem to be from the coast some distance to the east of Aden, and thence, as suggested by the lecturer, an explorer with local experience

might find his way to Marib and along the fringe of the desert to Nejran. Whether he could then get into relations with the Beni Kahtan and continue his journey northward, or whether he should try to work eastward along the old Sabæan trade route to Shabwa and the Hadramaut valley, must depend on the explorer's discretion. The latter alternative would no doubt help to solve some minor geographical problems, such as the upper course and source of the Hadramaut valley; but the main points of interest on the route, Marib, the Jauf, and Hadramaut, have been already examined by competent archæologists as thoroughly as present conditions of travel permit, and the geographical results would be small compared with what might be achieved on the northern route.

"As the operations in the Aden hinterland have been referred to, I would like to say that an exploring party was sent at the time from Aden towards Hadramaut, but was obliged to return after an attack by the tribes, in which the surveyor of the party was killed. Any exploration towards Marib, in territory claimed by Turkey, was out of the question while the boundary negotiations were being carried on, owing to the jealous suspicions of the Turkish officials."

That is what Colonel Wahab has to say about it, and if I could point out to you one by one the names he mentions in this paper, you would see that they coincide very fairly closely with the most important route indicated for future explorers by Mr. Hogarth. I would like to say for myself, that when I was at Muskat I heard a report that there was a direct route across the Great Desert from Muskat to Mecca, and that pilgrims from Persia made use of it. I never met any really competent authority who would justify me in stating that such a route exists. But reports like that, when they are constantly affirmed, generally have some basis of fact, and I believe that there is a route from Muskat, following the northern edge of the desert, running somewhat south of Riad, and so passing on to Mecca. This route, which is given in some maps, must be some 1100 miles in length, and it is stated that it takes twenty-one days to accomplish it. That would mean travelling at the rate of 50 miles a day. Not an impossible rate of travel in those regions, but it would certainly indicate that there must be oases and cultivated spots where water is procurable, of which we know nothing at all. I may also point out that there is in Arabia a certain amount of triangulation on which any traveller who wishes to begin an exact survey in the south-eastern portions of the desert might base his work. From the Persian coast it was carried across to Cape Mussendam, and peaks were fixed which at once brings eastern Arabia into line with the great Indian Survey. There is just one other point to notice, relative to Mr. Hogarth's concluding remarks on the subject of the use of instruments. I regard it as a very poor business indeed if a traveller can only depend on a prismatic compass survey. The results of such a survey are never very satisfactory, and I would point out that in the hands of our Indian explorers it has seldom been necessary to revert to this method. I admit that they have not been much employed within the limits of Ottoman territory, but they have been in that territory; and a great deal of the Kurd country, to say nothing of the central part of the Hadramaut valley, have been surveyed by Indian surveyors, who have used the ordinary instruments which we use in the Indian Survey with very useful results. In the Hadramaut particularly, you have seen some photographs which Mr. Hogarth has put on the screen which were taken, I think, by Mrs. Bent, which show that it is quite possible to use the camera in those regions. Where it is possible to use the camera, there, I maintain, it is possible to use instruments of a little better class than the prismatic compass; and I may mention that by the use of the plane-table, surveyors have been able to adapt themselves to circumstances in a variety of ways. It is really comparatively easy to take

plane-table observations without creating very much disturbance. If I remember right, Captain Bower, when he was crossing Tibet, used to ring a little bell in the evening to call the attention of the inhabitants of the country generally to the fact that he was going to say his prayers, and the instrument was accepted as part of his ritual. In a country which is particularly difficult to deal with, to the west of Makrán, bordering the Kurdish country (where I doubt whether any European could go), an Indian surveyor used a plane-table with great effect by combining it with a camera, and so long as he produced a few photographs at the end of his journey, he was quite safe. I would strongly recommend travellers to study the possibilities of making use of such instruments before starting. I will only conclude by expressing my cordial approbation of this lecture system of informing travellers beforehand where they are going and what they are going to do. In my own opinion, geographical work well begun and backed by such knowledge as experts like Mr. Hogarth are able to give, is work really half done.

Colonel MAUNSELL: My experience of travel in Arabia is confined to a journey down the Hejaz railway, but even this had a peculiar fascination from the strange grandeur of the scenery, the brilliant colouring of the landscape, where red, yellow, and purple were the predominant colours, and green was entirely absent. It might be possible to reach the Red sea from various points on the line, but a range of apparently volcanic origin, with a line of difficult peaks of a curiously jagged nature, would have to be crossed at the watershed. But routes certainly exist, and are travelled by the Arabs, the duration being from three to four days.

I think, undoubtedly, that the right spirit for a traveller to enter Arabia is to go as a gentleman of quality, paying a visit to the great chieftains of the interior, and it is useless to attempt disguises. It must be remembered that the great spread of Western thought throughout Asia has also reached Arabia, and the Emirs of Nejd might not be so averse to travellers visiting their country as they were formerly. In Kurdistan, the chief fascination of travel is that you may come across, in the forgotten corners of the great mountains, remnants of peoples of the past driven thither as successive tides of conquest passed by. In the Telu ranges are the Nestorian Christians of the period just before the Moslem conquest, and various settlements of Jews who had been there since the captivity. The district of Modikan, near Bitlis, would probably yield traces of Chaldean times. One great range there is named the Hormuzd Dagh, and there are strange stories of the religion and curious cave dwellings of the inhabitants. In the hills not far west of Modikan, differences are still settled by fights between men armed with swords, and protected by a leathern target. A Kurdish chief came out to visit me, attended by men with battle-axes and what resembles the lictors of ancient Rome, whose frontier fortress of Nisibis was not far distant in the plain below.

The district of Lazistan, on the Black Sea, can also be recommended to the traveller. It presents the beautifully wooded scenery common to the Black sea coast, the hills rise to some 9000 feet, and the summer climate is superb, while here also there are studies to be made in the former history of the population.

The PRESIDENT: Perhaps Mr. Bury will say a few words and tell us a little about the difficulty which he has met with in Southern Arabia in surveying and in dealing with the natives.

Mr. BURY: During the last ten years I have had occasion to go into the Aden hinterland on various work. I have got as far as the south-west corner of the Rubá el-Khali, or Empty Quarter. I have looked towards the north and north-east across 70 or 80 miles of rolling sandhills some 150 feet in height. Far across and probably about 30 miles due east of Mareb can be seen a flat-topped range of hills, known as the Hadhenah range, which are said to be of marble,

but more probably are of limestone. That marks the utmost limit I have ever seen of the Great Red Desert. I may tell you, as regards the difficulties which would be met with by an explorer in that district, that the chief of all would be the water-supply. Even the natives themselves have very hazy ideas as to where the water-holes and wells are. As a matter of fact, I believe the water-supply along the southern edge of this desert is much more plentiful than we are led by natives to suppose, owing partly to the presence of the larger fauna there, such as the white oryx and wild ass. The tribes living along the edge of the desert are of a truculent disposition, but amenable to reason. I believe it is humanly possible for a man to start on the coast, work his way up towards  $15^{\circ} 30'$  or  $16^{\circ}$  lat. N., and then to make his way across to the Persian gulf. He would have to be guided by the season of the year, and he would get into the desert as far as he thought wells would last him.

Prof. J. L. MYRES: I should like to express the satisfaction which it gives to have so full and clear an exposition of this region. A remark of the last speaker suggests that, in the map which illustrates Mr. Hogarth's paper, there is more than a superficial similarity in the distribution of comparatively well-explored areas and of the areas of large precipitation, and between the unknown areas and the areas of comparative drought. Indeed, I venture to think that the Society's cartographer has done well to employ red for the colouring of this map, and not the blue which one associates with the distribution of moisture, for really the distribution of exploration is so like that of the rainfall of the region that it was with a feeling of surprise that I found, when the map was first put into my hand, that it was not actually a rainfall diagram. To illustrate this point, I would only point out how the railway towards Mecca steers a line of compromise between the difficulties of the more mountainous region westward, and the difficulties, further east, of finding water for the locomotives.

Speaking as one who has made the geography of the past, rather than of the present, his study, I may perhaps be allowed to suggest a point of view in regard to this region. Like some of its own verbs, it has no present tense. It has a fine series of past tenses, and I believe it may have great future tenses; but in the present it is what the past has left it. It is not without reason, for example, that Mr. Hogarth took as the boundaries of his region precisely the boundaries which are assigned to Hither Asia by its first geographer, Herodotus, with his "column" of nations running from the Persian gulf to the Euxine, and his two peninsulas stretching out from it, Arabia and Asia Minor, the one with only three nations, and the other with thirty. And this ancient criterion, of relative populousness, is again in close conformity with the relative intensity of the colouring on Mr. Hogarth's map. He has had to deal in Arabia with an immense area, very ill explored; but it is one in which, from many points of view, there is not very much to know. We should not be unduly discouraged by the great blanks of light tint. In all probability the conditions which prevail round the edge of them simply increase in intensity towards the middle; and in that sense there is little probability that any great surprise awaits us in the desert interior. In the northern peninsula, on the other hand, the little regions of lighter tint are regions of unimaginable complication; regions where difficulties arise, not from absence of mankind, but from the denseness and compositeness of the population.

There are three points in which Mr. Hogarth has indicated subjects of inquiry for the student of human geography, as distinct from that of environment. In the first place, he has given us once more the prospect, based on native reports, that there exist in Southern Arabia fragments of that Negroid population which was placed there in the ethnological scheme of Herodotus; and for ethnologists such

a Negroid population is the only possible means of connecting the two great groups, eastern and western, of the black mankind of our own day. Secondly, one of the most fascinating projects for the explorer of this southern Arabia peninsula is that it has been, and is likely to remain, the fountain-head of successive Semitic emigrations; and when we consider what the world owes to the activity and thoughts of Semitic-speaking folk, their origin becomes the most fascinating problem of the whole range of human civilization. The third problem lies in those little unexplored regions to the north, for it is here that we have our only chance of discovering what the population of Asia Minor and all that great mountain region was like, before the intrusion of nomad folk from the grasslands of the south, the north-east, and the north.

I welcome particularly Mr. Hogarth's opinion that there is still a great deal to be done by that sort of explorer who is content to take a very little district and know a great deal about it. The triangulation and outline survey of great regions is of course of prime importance; but after all the three sides and the three angles of a triangle are there to enclose a space, and for a great many geographers it is rather that which lies within that space than the precise dimensions and proportions which are of interest, and I am glad to hear an explorer, with the experience of Mr. Hogarth, emphasizing the value for geographical purposes of the comparative humble traveller who will take a district and settle down there for three months, or even three weeks, and try to learn its contents from every point of view.

One last point. Mr. Hogarth has shown us how greatly our knowledge has depended in the past upon the work of explorers whose object was not geographical, but commercial, political, or military; and he mentioned one instance recently where an opportunity was missed of exploring geographically, as well as in a military sense, a fragment of the south-west corner of Arabia. I hope that among other results this series of lectures will be the means of attracting and instructing that wider circle of people which has the power, if it will, of insisting that next time anybody goes anywhere with a rifle in one hand, he shall take a theodolite in the other.

Mr. H. J. L. BEADNELL: In spite of native reports—in my experience frequently untrustworthy—it does not seem at all unlikely that in the great deserts of Arabia discoveries of the first importance await us. Geologically, Arabia may be regarded as a portion of the Sahara, the Red sea having been formed by subsidence of part of the country in comparatively recent times. Although our geological knowledge is lamentably deficient, we know, from the researches of Carter and Blanford in the south, from the observations of Blunt and others in the north, that the peninsula must be considered as the eastern portion of the great Saharan desert plateau. As in the Egyptian deserts, the basis of the country consists of crystalline rocks, overlain by horizontal sedimentary formations of Cretaceous and Eocene age. Such familiar Saharan formations as the Nubian sandstone and the Nummulitic limestone are well known to have, in many respects, a very similar development in Arabia, and it is not unreasonable to assume that they to some extent beget similar physical conditions. Although the eastern portion of the Sahara—the Libyan desert—of which, after many years' exploration, I can perhaps claim to speak with some authority, is one of the most rainless regions in the world, absolutely devoid of streams and rivers, large communities are enabled to exist in the huge oases depressions of its interior by reason of the presence of the underlying sandstone charged with abundant supplies of pure artesian water. Even at the present day the four large Egyptian oases alone contain 30,000 souls, self-supporting and irrigating their lands entirely by underground water. Moreover, during the Persian domination and in Græco-Roman times these oases were of still greater importance.

When, therefore, our explorers, overcoming the existing difficulties, obtain access to the arid plateaux of the Ruba el-Khali and Nefud deserts, let them recollect the possible presence of strata containing an abundant supply of deep-seated water, and carefully look for depressions where such beds may lie within reasonable distance of the surface. Even should such depressions be found uninhabited at the present day, it is not unlikely that a careful examination will reveal traces of former occupation, in the shape of sanded-up wells, subterranean aqueducts, and ruined forts and settlements.

**THE PRESIDENT:** Before calling on Mr. Hogarth to reply, I am sure I may, in the name of every one here present, give him a hearty vote of thanks for his extremely interesting lecture. We have often heard in this lecture-hall the fear expressed that there was no exploration left to be done, and the hope expressed that the whole world would soon be mapped. I think this lecture destroys these hopes and these fears. Mr. Hogarth's lecture will, however, tend to stimulate explorers, and to fix their minds on that part of the map to which attention should be given. There is plenty to do for the accurate observer and for the man who is ready to take his life in his hands. I will do no more than express our thanks to you, Mr. Hogarth, for your lecture.

**MR. HOGARTH:** I can only thank you, ladies and gentlemen, for having listened to me so patiently. Just two words in reply by way of explanation. Colonel Maunsell, I was very glad to hear, gave some further account of certain districts which are still unexplored. Of course it would have been possible to have compiled a paper, and also a map which would have more exactly shown each particular district, however small, which has not been visited by Europeans; but it would have been impossible to have read that paper or to have conveyed its sense to you orally. As a matter of fact, even in western Asiatic Turkey, there are quantities of small districts, which, so far as we know, have not been visited, and one might therefore have made a map which would have been dotted over with little white spots. That, however, was not my intention, and therefore I took the two Kurdish regions, which seemed to me the most important among the still absolutely unvisited regions. Still, those regions to which he called your attention are also of very great interest, and I hope explorers will endeavour to gain as much more information about them as about those two of which I spoke. The only other point has regard to what Sir Thomas Holdich said about the use of instruments. It was only due to the condensing of my paper in reading that I gave the impression that nobody could use anything but a prismatic compass. What I meant to say was that, in the comparatively civilized and well-administered parts, it is, I think, difficult to use anything more elaborate. There, at any rate, you will arouse native suspicion, and have the emissaries of a comparatively civilized Government down upon you. It is one thing to set up a plane-table in a savage land, and to expect to have your observations regarded as part of your prayers; but it is quite a different thing to do that in many parts of Asia Minor, where you will generally find, at any rate, some Christian who will be quite aware of what you are doing. I was really speaking of Asia Minor more than of anything else, and I did not mean to imply that over a great part of the region it was only possible to use what, I agree with Sir Thomas Holdich, is a very unsatisfactory method of surveying. As regards Marib, Colonel Wahab seems to regard the exploration done there as more complete and more satisfactory than personally I should regard it from what I have been able to read. Glaser was there for a month under the direct protection of a number of Turkish soldiers; but the natives were hostile to him, and he himself confessed that he had by no means exhausted the possibilities of the district. For one reason or another, he never published one-half of what he actually saw there, nor

any photographs of the ruins. He is now dead, and I have not heard that there is likelihood of any more of his notes being published. Therefore one must regard that region as, from an archæological standpoint, only half explored.

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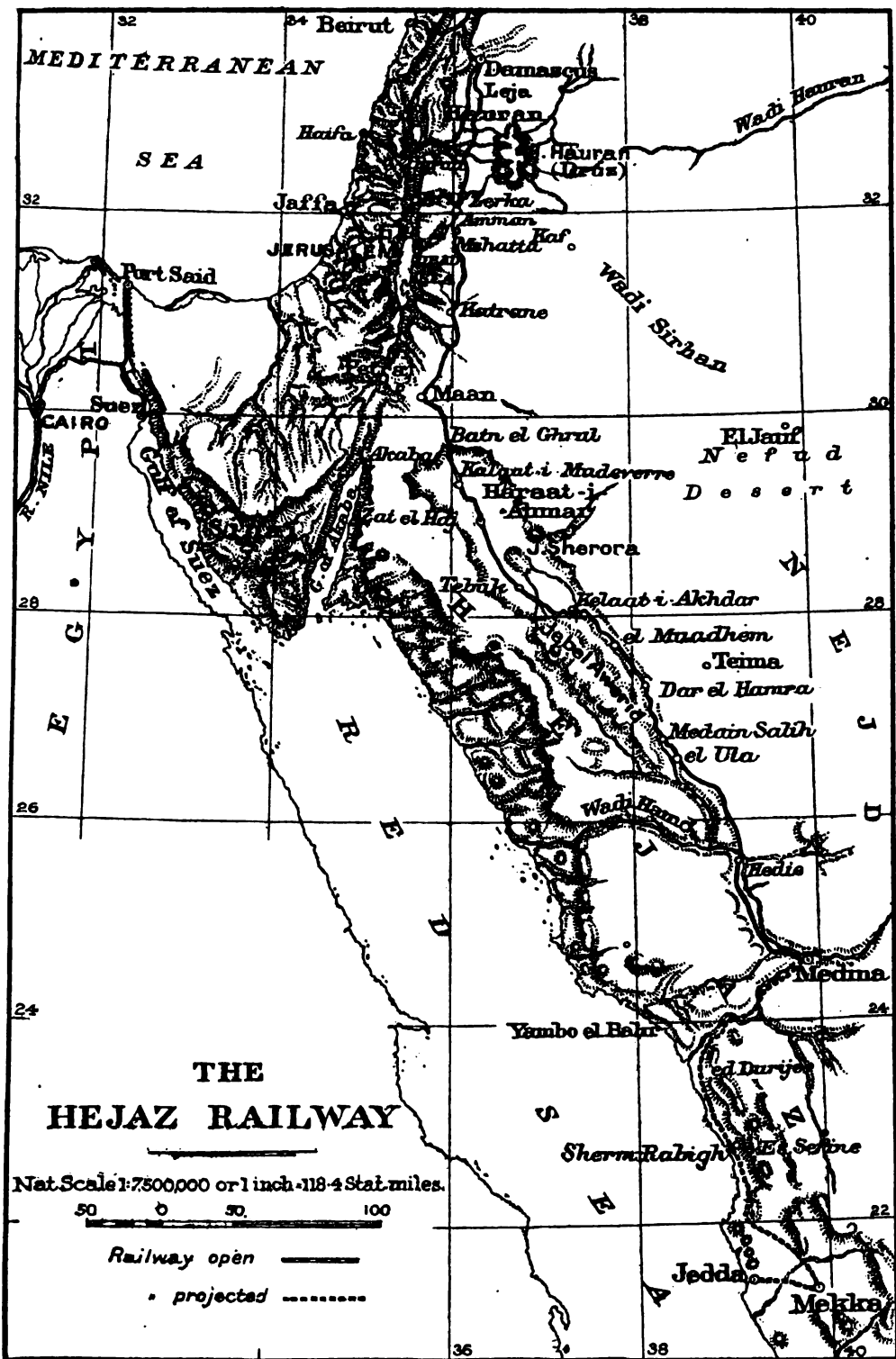
## THE HEJAZ RAILWAY.

By Lieut.-Colonel F. R. MAUNSELL.

THE Hejaz railway has many remarkable features which distinguish it from other lines. Its principal object is to provide a means for faithful Moslems to perform their pilgrimage to the holy places of Mecca and Medina with a greater degree of comfort than formerly. There are still many of the more rigidly orthodox who prefer the long tedious journey by camel, with its fifty-two stages from Damascus to Medina, and count the hardships involved as part of the duty of pilgrimage. The railway also has the object of binding together some outlying provinces of the empire to the centre. Its inception is due to the initiative of the present Sultan, and the enthusiasm created by its first announcement brought in subscriptions from the faithful in all parts of the Islamic world. A special stamp-tax forms a solid annual contribution to the expenses, somewhat less evanescent than other contributions may prove to be.

Geographically, the line has provided a means of travel in a country with a fascination of scenery quite peculiar to itself, and unlike any other part of the world. Instead of traversing populous countries and great cities, it seems to delight in passing through immense solitudes—through a country peopled mainly by the spirits of the Arabian Nights, where little surprise would be occasioned in finding a roc's egg in some inhospitable rocky valley, or in seeing a genie floating in a stream of thin vapour out of a magic bottle.

The line commences at the traditional parting-place of the Great Pilgrimage, the Bawaubet Allah, or Gate of Allah, and the first station is the Kadem-i-Sherif, the noble starting-place, shortened in vulgar parlance by the railway porter to Kadem. At first the line traverses the Hauran, running parallel to the French Hauran railway. From ancient times the district has been an extremely rich one, and the Romans used it as a granary. Both lines of rail find sufficient traffic, besides which the opening of the Hejaz line has been a means of opening up the trade of the Jebel Druz or Druse mountain, which sends its trade to Ezra and other small stations in that vicinity. The line, moreover, has brought general security, and the area under cultivation is increasing. From Deraa a branch runs to Haifa, on the Syrian coast, where a harbour is to be constructed. Quite a good restaurant exists at Deraa, and there is an increasing tourist traffic on this part of the route.



The richness of the Hauran is undoubtedly derived from its volcanic origin. Distinct layers of basalt can be traced in the side ravines of the Yarmuk, while on the east the line skirts close to the curious volcanic mass of the Leja, which has been cooled at a more recent date, and is still in the form of a wild tumbled mass of black scoriated rocks strewn some 30 to 40 feet deep.

The deep, narrow ravine of the Yarmuk, the ancient Hieroymaz, which the line follows in its descent to the Jordan, present several difficulties of engineering successfully overcome. Large numbers of Italian, Montenegrin, Croatian, Greek, and other European workmen had to be employed on the difficult rock cuttings, tunnels, and viaducts of this section.

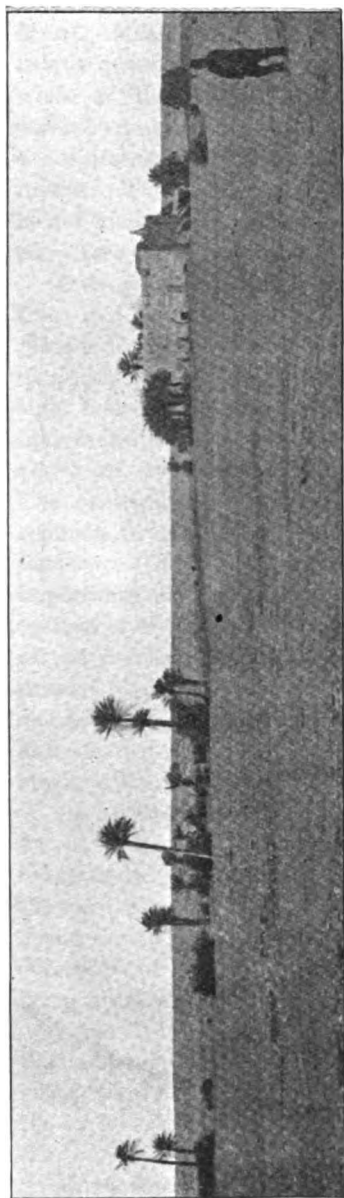
The Jordan valley, where the line crosses it, just south of Lake Tiberias, is 800 feet below Mediterranean level; but the difficulties of construction cease when the Yarmuk valley has been successfully traversed, and the ascent to the sea is made by easy gradients.

South of Deraa the main line soon leaves the richer corn land, and enters an upland undulating country, the land of Bashan, producing abundant grazing in the spring. At that season troops of gazelle roam about the country, and the Bedawin with vast herds of camels are found close to the line.

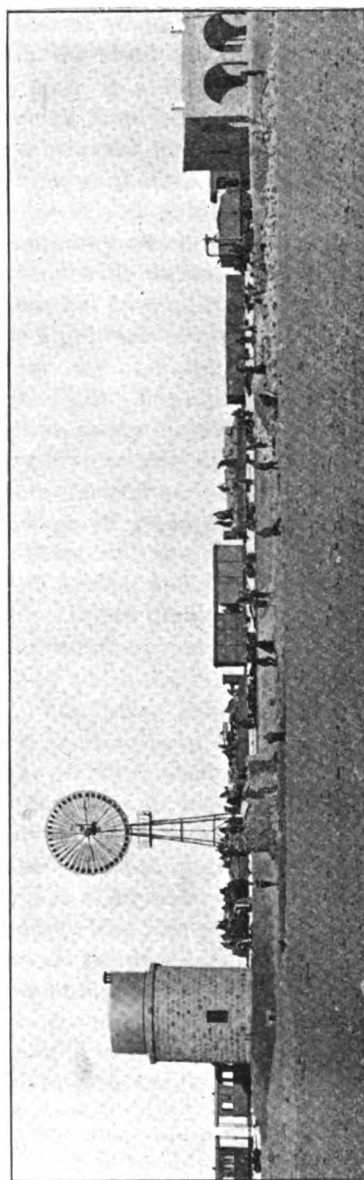
At Zerka the line descends into a long ravine in a limestone country, having a good stream in the valley. Here are reached some villages of Circassian settlers, who have worked wonders in restoring the ancient fertility of this district. The ruins of Rabboth Ammon are close to the modern station of Amman, another Circassian outpost on the line. The line winds steeply out of the valley, which follows a deep-cut ravine in its course to the Dead sea below Amman. Fertile cultivated ground continues for some miles past the ruins of Mshatta, and then the line leaves what may be called the last cornfield and plunges into Arabia Petraea. The landscape gets bleaker as the train moves south. The mountains of Moab are passed some distance to the west, and the trace is laid far out in the desert, where the valleys are wide and easy to cross, and before they deepen into narrow ravines as they enter the mountains.

The old pilgrim route is followed very closely throughout, and at the stations the stone cisterns and reservoirs to provide a supply of water to the pilgrims are noticed. Water becomes very scarce; in a few places wells have been dug, and water is raised by wind-pumps. For some reason, boring for artesian wells does not seem to have been tried. One attempt was made in rocky ground, and when the drills broke no further attempts were made.

As the line approaches Maan an extremely desolate country is traversed; low ranges appear to the east, apparently of sandstone or limestone formation, although the ground is strewn thickly with black



PILGRIM ROUTE TO MECCA, KALA OF ZAT-EL-HAJ.



HEJAZ RAILWAY: KALAAT-I-MUDEVERRE STATION.



fragments of obsidian along some sections of the line. The ravines now trend eastward to lose themselves in a wide depression in that direction, as shown in the recent maps of this country by Prof. Alois Musil. Maan is the first point since Amman where water is procurable in any quantity, either from springs in the small town itself, or from wells at the railway station. The place is a large railway, with several stone buildings for officials, a small shop for temporary repairs, a hospital, and quite a good hotel, a substantial building rather small in size. The small town, containing some good stone and mud houses, is not visible from the railway, but lies behind a hill nearly a mile off. Two copious springs supply the necessary water.

Date palms are reared, small gardens with various kinds of fruit trees, and a few fields of corn are visible, but from a little distance the place is little else than a drab patch on a grey landscape. Its principal distinction is its proximity to the rock city of Petra, a ride of some eight hours to the west among the Moab hills. The climate of Maan is invigorating both in winter and summer, as the place stands 3525 feet above sea-level, surrounded by the dry invigorating air of the desert. The principal drawback are the severe duststorms. Rain is not uncommon in the spring, and then a tinge of green spreads over the landscape. The ancient fortress of Petra and now Maan owe their importance as standing at the gate of Arabia, and forming the last outpost of Syria and Western civilization before the long dreary stages of the northern Arabian journey. For countless ages, long before the present pilgrimages, this was the route by which the gold, frankincense, and Arabian products found their way into Syria; but the Suez canal and steamer transport by the Red sea seem to have abolished all, or almost all, trade prospects, and only the pilgrims remain.

On leaving Maan it may indeed be said that all hope of dividend is left behind, and the line enters a spirit world without towns or even inhabitants. The stages south of Maan, the old pilgrim route, were the most desolate of all, and the way was always strewn by dead and dying camels as the caravan toiled along. The line crosses a constant succession of small wadis trending towards the depression mentioned as lying north-east of Maan, and some low bushes and vegetation appears.

Some 50 miles south of Maan comes the most remarkable change in the landscape, and the veritable gate of Arabia and the home of the genie is at last reached. The line arrives quite suddenly at the edge of the curious escarpment known as the Batn-el-Ghrul, or the Hollow of the Genie.

From the station of Batn-el-Ghrul, at the top of the descent, the traveller can walk to the edge of the cliff and take in the immense extent of view which unfolds itself to the south. The escarpment is visible for some 20 miles to the east, and is a sheer cliff without, it is said, a single passage of descent, and, although perhaps footpaths

could be found, this looks to be the case. For some 15 miles to the west, also, the escarpment is fairly well defined, until it merges in the high ranges overlooking the Gulf of Akaba. The pilgrim route follows the descent close alongside the line, and is comparatively easy. The principal descent is from 3207 feet at the summit to 3278 at the foot of the escarpment, or 829 feet altogether.

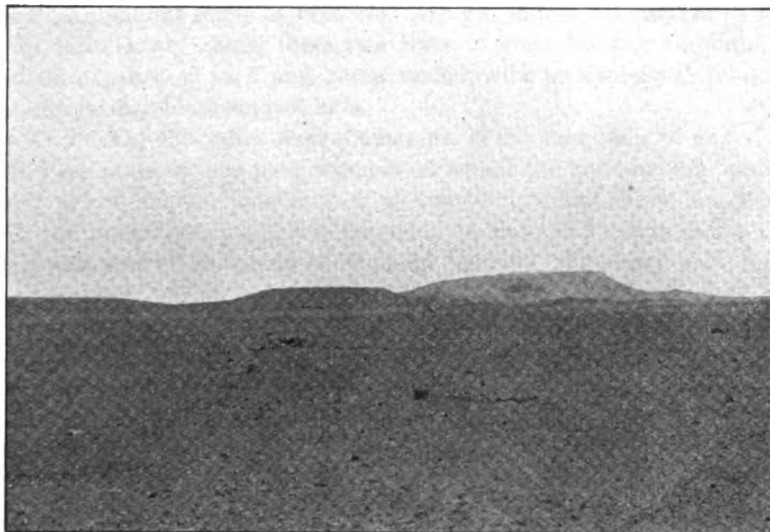
The view from the summit is extremely striking, and comprises a great inland depression, walled in by a continuation of the escarpment on the east, and glowing throughout in the most brilliant and striking colours. The prevailing note is bright red and yellow, changing to violet, purple, and black, so that every tint, except green, seems to be supplied. The escarpment is of sandstone, which seems to have worn away in some places to sand drifts of all colours, but principally red and yellow. The spurs of the Tel-esh-Shahim, which run out parallel to the line, are covered with glistening black rocks, at first sight volcanic, but, as I was told by an engineer, were really of sandstone blackened by the intense heat of the sun. The depression extends south as far as the gorge near Kelaat-i-Akhdar, a distance of about 120 miles.

In this clear, dry air every feature is visible. A number of isolated flat-topped hills form the Haraat-i-Ahmar about midway down the valley, and the great pinnacle of Jebel Sherora is visible near the extreme end. To the west, the watershed which divides from the Red sea is clearly traceable in a range of dark purple hills, the summits serrated in all sorts of fantastic shapes, probably due to volcanic action and without the softening influence of a rainy climate.

The railway accomplishes the descent of the escarpment in two loops, which form a clever piece of engineering, after which the Wadi Rutm, a sandy ravine about half a mile wide, flanked by two ridges of sandstone, is followed for a few miles. South of Wadi Rutm station the line enters definitely the open depression, with the escarpment still traceable in red and yellow sandstone some 20 miles to the east, and the black jagged edge of the Red sea watershed to the west. Inquiries regarding the country to the east gave it as an almost waterless region, although a route does exist from Maan to Jauf, along which some scanty wells can be found.

Towards the Red sea the district is known as el Hisme, and is said to contain a few villages, and a sufficient supply of water from small springs. At Kalaat-i-Mudeverre, the first water since Maan is obtainable from a station well with a wind-pump, and another well near the old castle on the pilgrim route about 2 miles to the west. There is little trouble on the line from sanddrifts, as a hard surface can easily be found, and rocky ground is seldom far distant below the surface.

At Zat-el-Haj a group of a few palm-trees represents the first vegetation since leaving Maan. An interesting old masonry fort commanding



COUNTRY EAST OF LINE NEAR TEBUK.



OASIS OF TEBUK, KALA OF TEBUK.



access to the well, and representing a halting-place on the pilgrim route before the railway was opened, is the only building on the landscape here. An endless series of beautiful mirages unfold themselves as the train toils slowly along these two lines of steel leading through an endless expanse of sand and rocks varied, with an occasional volcanic outcrop raising black-topped hills.

At Tebuk, 430 miles from Damascus, is the first oasis of any size, and here a *dépôt* has been formed, at which the railway can recoup itself before another long stretch of nearly waterless desert is entered and the next *dépôt* at El Ula reached. A group of buildings for the employés, a small repairing shop, and a hospital with sixty beds, form the principal part of the *dépôt*.

Tebuk consists of a group of date palms about half a mile square, deriving water from a large spring, walled round in a concrete basin, and watched over by another of the masonry forts which mark a pilgrim station. Altogether there were about sixty mud houses with a few walled gardens belonging to the permanent inhabitants of Tebuk. All that were seen were of a distinctly negroid type, different to the nomad Bedouin. The surrounding country is but sparsely inhabited by Arabs of the Beni Atiye tribe here, and the Huweitat farther north. Besides date palms, there are in the gardens a few lemon trees and pomegranates, and outside are some few fields of wheat cultivated principally as green fodder. The Italian engineer in charge of this section had managed to make a garden in the sand, where by means of irrigation he grew most kinds of European vegetables, but none of the inhabitants seemed inclined to copy his example.

East of Tebuk the escarpment is about 15 miles distant, and prominent in the main ridge there is the remarkable hill of Jebel Sherora, or the Fire mountain. It has extremely steep stony slopes and a flat summit, from which a most extensive view must be obtainable over the unknown country to the east.

It seems certain that Mohamed visited Tebuk in his earlier wanderings, and tradition refers to Jebel Sherora as the Pulpit of the Prophet, probably from its commanding position overlooking all the surrounding country. To the west is still visible the dark serrated ridge which forms the watershed with the Red sea.

The rainfall in this country is extremely capricious, and perhaps two or even three years may elapse before there is any appreciable fall here, although at Maan there appears to be always some rain in the spring. Quite heavy rainfalls do sometimes occur in Tebuk, as, for instance, in 1907 some 5 feet of water flowed for a short time down the Wadi-et-Til and under the long railway bridge of twenty arches which spans it. The rainfall tends to form temporary lakes in certain wide hollows, the largest being between Tebuk and Jebel Sherora, which receives the Wadi-el-Til and Wadi Akhdar from the south,

both of them of considerable size, especially the latter, which has numerous tributaries. Other smaller wadis enter the depression from the north, and sometimes the lake remains sufficiently long to breed mosquitos in Tebuk. The water from Kalaat-i-Mudeverre and Zat-el-Haj runs into smaller depressions near those places and also evaporates under the intense heat of the sun. After rain, green vegetation springs up along the wadis. In the Wadi-et-Til (or Ithil) is a fringe of low trees of a kind of tamarisk (*Tamarix articulata*). There is also a species of low acacia, and some smaller shrubs.

Of animal life there appears to be very little. An antelope which the Turks call a wild cow, but which looks to be *Oryx beatrix*, is to be found in this district, but only in small numbers. The large troops of gazelle seen north of Maan do not roam here. It is said that the ostrich is occasionally found, and the skin of one specimen is preserved in Maan station.

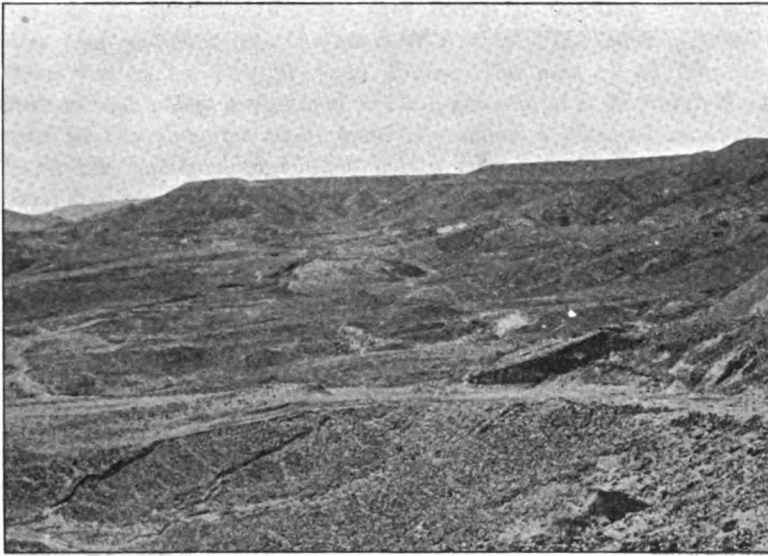
The desert air is extremely dry and clear, always invigorating, and even the great heat in summer is not as insupportable as in a damper climate where the thermometer is probably lower. Climate has, without doubt, a great effect on the human character and intellect, and the nervous, high-strung temperament of the Arab is to a great extent the creation of his environment of desert, with its splendid mirages to fire the imagination and sparkling air to keep the nerves always alert.

South of Tebuk the line continues over the plain until the southern edge of the depression is reached at Dar-el-Haj, where the hills close in, and, after passing through a short tunnel the line enters the narrow valley of the Wadi Akbar. Construction is easy, as the gradient is gradual and the valley floor is nearly level and about half a mile wide, but bordered for most of the way by a sharp line of sandstone cliffs.

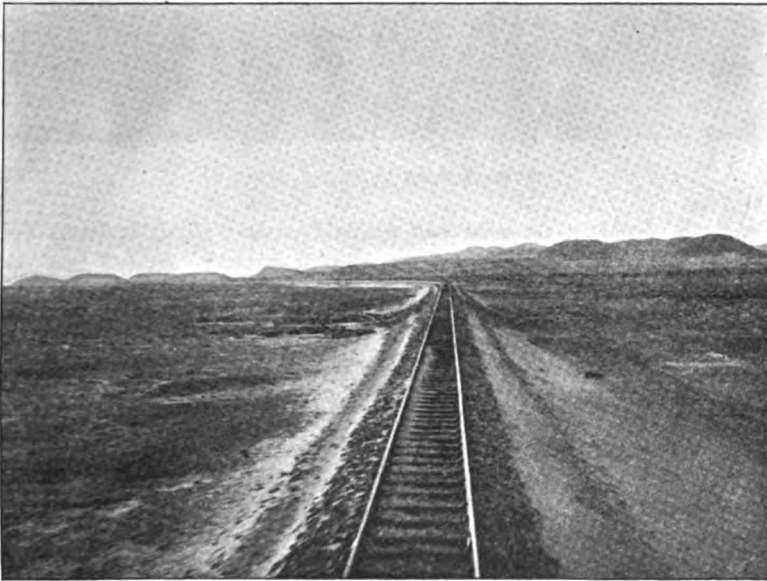
To the eastward is the volcanic mass of the Jebel Awerid, a very difficult country to traverse, and with no distinguishing peaks or features.

Want of water is again a great difficulty, and the small posts have to be supplied daily from the train. At Kelaat-i-Akhdar is a small spring, and at El Muadhem is a cistern depending on rain-supply; at both these places are the small forts which denote halting-places on the pilgrim route. At Dar-el-Hamra is reached the summit of the watershed between the Wadi Akhdar flowing into the Tebuk depression, and another wadi; tributary to the Wadi Hamd, which flows to the Red sea.

At Medain-i-Salih the valley widens a little, and here are found some rock-cut tombs similar to those at Petra, but far fewer and less ornate. Traces of a town exist, but there is nothing now visible except the usual fort of the pilgrim. Here again, as well as at Tebuk, the site would seem a favourable one for trying artesian wells, but no



BATN-EL-GHRUL ESCARPMENT FROM THE EAST.

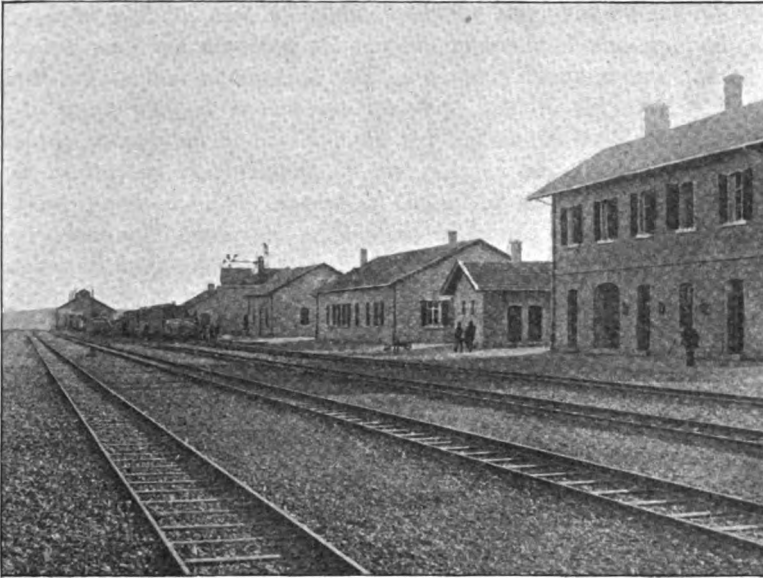


APPROACH TO HABAAT-I-AHMAR FROM SOUTH:



attempts have been made to prove their success or otherwise. This place and El Muadhem are the first points on the line from which routes lead eastward into the heart of Arabia. The curious town of Teima, visited by Doughty and Euting, lies east of El Muadhem, and from both places routes lead to Hail, the capital of Northern Nejd.

At El Ula the first small town is reached, a place of about 3500 inhabitants, partly negroid and partly mixed Arabs, in an oasis of palms and gardens about 4 miles long, watered by some springs.



HEJAZ RAILWAY: MAAN STATION.

Here the last depôt before Medina has been constructed, similar to Maan and Tebuk. Construction onward to Medina is not difficult, as the valleys branching north and south at the head of the Wadi Hamd can be followed even up to Medina itself. Between Medina and Mecca the line makes a westerly bend, passing through Sherm Rabigh on the Red sea, this having been found the easiest line for construction.

The permanent way has been laid throughout by Turkish soldiers; but the station buildings, all of very solid masonry, as well as bridges and culverts, of which there are a great number, have been constructed mostly by Italian workmen, with some Greeks and Montenegrins. As many as three or four hundred Italian workmen were employed at one time on the works near Tebuk, and so little did fanaticism come into play, that they built the fine new mosque at Tebuk. Subsequently they instructed some Turkish engineers, who continued the work from El Ula to the holy city itself.

It is difficult to think of this railway becoming a great highway or developing any great trade with Central Arabia, as the section from Maan to Medina traverses an unproductive country without possibility of development, and the interior of Arabia has no surplus products to dispose of. In any case, when the line reaches the sea at Sherm Rabigh, it is probable that any trade, either export or import, to Medina or Mecca will pass through that port in preference to the long land journey.

The following summary of distances shows the extent of the line:—

Damascus to Maan	...	...	...	...	285 miles.
„ Tebuk	...	...	...	...	490 „
„ el Ula	...	...	...	...	609 „
„ Medina	...	...	...	...	820 „
„ Mecca	...	...	...	...	1097 „

The general height above sea-level is about 2300 feet, although at Maan it rises to 3525 feet, and at Dar-el-Hamra, the watershed of the Tebuk depression and the Wadi Hamd, it attains 4200 feet, which is the highest point.

The gauge of the line is the somewhat curious one of 1·05 metre (3 feet 5½ inches), which was necessary when the line was first commenced to correspond with the gauge of the Beirut-Damascus line, over which the rolling stock had to be brought. The branch to the Mediterranean at Haifa was constructed subsequently. The rolling stock has

been obtained principally from Belgium, with the exception of the engines, which are made by a German firm. The rails were supplied by the American Steel Trust, by a French firm domiciled in Russia, and by the firm of Cockerill, in Belgium.

The engineers in charge of sections were also of various nationalities—French, Poles, Hungarians, etc.—while the guiding spirit in the construction has been Meissner Pasha, a very able German engineer. But besides these, the general direction has been under Marshal Kiazim Pasha, to whom the greatest credit is due in bringing the line successfully into Medina, and to Hajji Mukhtar Bey, a brilliant Turkish engineer who has absorbed all modern methods of construction, and completed the last section into Medina without European assistance.

In conclusion, it is difficult which to admire the most, this far-reaching conception of his Majesty the Sultan to build the line and thus to further the interests of his religion and bind together the outlying portions of his empire, or the silent unswerving devotion of the Turkish soldier who has carried the matter to a conclusion, and who watches without complaint over miles of line through a country almost without water or inhabitants.

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## DR. SVEN HEDIN'S EXPEDITION IN TIBET.

By Major C. H. D. RYDER, R.E.

DR. SVEN HEDIN has returned from another two years spent in explorations in Tibet, and as I have had the opportunity of hearing from him a fairly full account of his work, I am sending this paper, which has been authorized by him, for publication in the *Geographical Journal*.

After a preliminary journey through Persia and Seistan, Sven Hedin arrived in India, and after overcoming rather more than the usual difficulties, left Leh on August 14, 1906, with the strongest caravan he has ever had: 25 men and 94 ponies and mules, as well as 30 ponies he hired for the first month; of the 94 ponies, only 6 completed the journey. He was accompanied by a babu Robat, who proved of much use in assisting in scientific observations, as well as Mahomed Isa, who acted as caravan bashi; this man had accompanied Younghusband in his travels, and to Lhasa, was with De Rhins when he was murdered, and was with Rawling and myself in 1905. Sven Hedin speaks in the warmest terms of the invaluable services of this man. He also constantly refers to the kindness he received from the Maharaja of Kashmir, the state officials, Sir Frank Younghusband, Captain Patterson at Leh, and others.

After leaving Leh, Sven Hedin travelled north-east over the Mar-simik-la, crossed the Karakorum east of Changlung-yogma, traversed

Ling-shi-tang and Aksai-chin, crossed Deasy's, Rawling's and Wellby's routes; he then kept east and east-north-east, and turned south-east between the routes of Bower and De Rhins. On the heights of the Buka-mangna route, 9 mules were lost in one day, but to the south the country became more and more hospitable, with plenty of grass and water. After eighty-three days they met nomads for the first time; but then their black tents were visible most days, and they were able to buy yaks to replace the ponies they had lost *en route*. They left De Rhins' Ammoniac lake to the east, and continued straight south to the Bog-tsang-tsanpo, which they followed for a couple of days to get a connection with Sven Hedin's map of 1901. Turning again south-east they crossed two considerable ranges, from one of which a small portion of the Dangra-yum-tso could be seen to the south. Sven Hedin reached Ngangtse-tso on December 28, and here he was met by Hladje Tsering, governor of Nak-tsang, who had already stopped him on his previous journey, and who, though at first inclined to stop him, allowed him to continue south-east. With great good fortune, or probably with the instincts of an experienced Tibetan traveller, Sven Hedin hurried on, and, without halting, and making long marches, struck the Tsanpo 50 miles west of Shigatse, and, following down the left bank, crossed the river and reached that town late on the evening of February 9, 1907. Two days later a lama and official arrived from Devashong; they had received orders to stop Sven Hedin at Ngangtse-tso. Not finding him there, they had followed him to Shigatse; but it was now too late, Sven Hedin had reached that town and accomplished one of the objects of his journey.

The most important geographical discoveries on this journey were (1) the discovery of a very high and complicated mountain system, and (2) south of it the Mu-ohu, which joins the Raga-tsanpo; the latter is the smaller of the two, and most of the water which joins the Tsanpo just west of Pindzo-ling comes from the Mu-ohu. The discovery of the high mountain system set Sven Hedin thinking, and it very soon struck him that this must be a continuation of the Nien-chen-tang-la range south of Tengri Nor, the highest peak of which I fixed from near Lhasa at 23,900 feet. The Khalamba-la, on the road from Shigatse to Tengri Nor, is also on this range. Thus was forged the first link in what Sven Hedin regards as his greatest discovery.

Sven Hedin stayed one and a half months at Shigatse, during which time he made great friends with the Tashi Lama, and constantly visited the Tashi-lunpo monastery. Although so close to Gyantze, he did not think it advisable to visit Captain O'Connor there, but speaks in the warmest tones of the kindness he received from that officer. After much difficulty he obtained permission to go up the Raga-tsanpo route, and, turning northwards, recrossed the main range by the Chang-la Pod-la pass, thus fixing another 50 miles of the range. His next objective was

the Dangra-yum-tso, discovered by Nain Singh; but when within two marches, and in sight of the lake, he was stopped by a force from Shan-sa Dzong and forced to go down south to Raga-tasam, but he was able to fix the position of Targo-gangri, Targo-tsanpo, and Sershik-gunpa, all three heard of but not visited by Nain Singh. The Shuru-tso was also discovered, a rather big lake at the northern foot of the main range, another 60 miles of which being also fixed, as the range had to be once more crossed. At Raga-tasam Sven Hedin touched our route for the first time since leaving Shigatse. Dangra-yum-tso is much too big on Nain Singh's map; and his Mun-tso, two small lakes, are situated not south but west of the southern Dangra-yum-tso. The latter lake, and Targo-gangri, which Sven Hedin describes as one of the most magnificent snow-mountains with glaciers he has ever seen in Tibet, are both holy, and form the same combination as Mansarowar and Kailas in the west, and Nam-tso and Nien-chen-tang-la in the east. Sershik-gunpo is inhabited by monks of the Pombo (non-orthodox) sect. From Raga Sven Hedin went to Saka-dzong; needless to say, not by the route followed by our party, but round the north side of the beautiful snows of Chamo-uchong. At Saka Mahomed Isa died, to the great grief of Sven Hedin and his followers, and to all those to whom he has been of such assistance in the Tibetan explorations.

Sven Hedin again wished to strike north, but could not get permission to do this, although he sent messengers to Lhasa. He, however, turned north from Saka Dzong up a western tributary of the Chaktak (called Charta on our maps) Tsanpo, behind the hills north of our route to Tradom. He then kept south of the river, touching our route at Lak-tsang, and marching up the main branch of the Brahmaputra to its source, which he located accurately and surveyed. In the *R.G.S. Journal*, vol. 38, p. 146, Nain Singh mentions being in sight of the gigantic glaciers which give rise to the Brahmaputra. On our journey we surveyed, though only roughly, the main branch; but as Sven Hedin was the first to actually follow the main branch to its source, we obtain a survey much more accurate than mine, which was only a distant sketch. Crossing the watershed, which is very low, Sven Hedin proceeded to the Mansarowar lake, where he spent some weeks making careful soundings. Owing to dangerous gales, it was impossible to sound the Rakas Tal, but both lakes were carefully surveyed. Following down the bed of the old outlet, Sven Hedin found several springs, which probably are underground channels from the lake. There was no sign of these when Rawling and I were there in December; but as the Rakas Tal was then frozen over, doubtless the springs were also frozen. This, however, proves that the lakes are still connected, though underground, with the Sutlej system. After an interesting circumambulation of the holy peak of Kailas, Sven Hedin managed to get permission to go north, where he discovered the source of the

northern or main branch of the Indus, returning *via* Yumba-matsen to Gartok.

The gap of 300 miles in his exploration of the main range north of the Tsanpo called Sven Hedin for yet another long journey. All attempts to go north-east from Gartok failing, he decided to make a long *détour* and come into the unexplored country from the north. He gave out that he was going to Khotan, in the mean time arranging for an entirely new caravan, with new men, to be organized at Leh. He met his new caravan at Durguh, and left that place on December 4, 1907. Several caravans from Yarkand were used, the members of which advised Sven Hedin to wait till the spring. However, although winter had set in, he passed on. At Burtse he discovered that, owing to the stupidity of his headman, only a supply of eight days' corn for the ponies was left. It was not till at the crossing of the Dapsang that he gave orders to turn due east, leaving the Karakorum pass to the north. On January 11 they camped on the shore of the Aksai-chin lake. By January 18, a quarter of the caravan ponies had died, and the cold was intense. To improve matters a storm arose, which lasted for weeks; the caravan, however, pushed forward steadily, but very slowly. On the northern shore of the Shemen-tso they were nearly snowed up, no meat was left, and the ponies shared the men's rice rations. On February 8 the first hunters were met with, after sixty-four days' loneliness, and they were able to buy sheep, milk, and butter. Here Sven Hedin burnt all his European clothes, and appeared as a Ladkhi; this entailed blacking his face and hands every morning, and forbade washing. Passing the Lemohung-tso, they now entered unknown country. On February 24 three ponies and seven mules only were left, a quarter of the caravan. On the 29th they reached Lumburringmo-tso, where nomads were met with; these men, although at first suspicious of the presence of a European, soon made friends and sold twelve sheep to carry loads. For several days the storm was so bad that a move was impossible. On March 7 Sven Hedin camped on a river flowing to the south-west, but frozen over.

On March 16 they pitched camp on the Tong-tso, and turned south leaving the beautiful Gangri Shakang-sham to the east, and crossed two small passes. They here heard that Karma-Pun-tso, the governor of the Bongba province, was near, but they avoided him, and proceeded through a labyrinth of mountains, crossing the Kang-shan-tsanpo, Chaklam-la, Sangchen-chu, Sangchen-la, and Ladung-la. On April 1 Sven Hedin crossed the Satsot-la, and came down to the Chunit-tso, following its western shore for one day. Here a large salt caravan was met with coming from Tabié-tsaka, from whence most of Central and Eastern Tibet obtain their supply of salt. Still keeping straight south, Sven Hedin crossed the Nima-lung-la, and reached the district of Kemar. From here, once more, he was in sight of the range north of the Tsanpo, a beautiful sight of great snow-fields and glaciers. He

now turned south-east, having the magnificent Hlunpo-gangri on his right, and for six days followed the big river Buptsang-tsanpo up to the Samye-la, a pass in the main range. It was here that the name Trans-Himalaya struck him as most suitable for this range. Although Tibetan names are obtainable for every conspicuous peak in this range, the Tibetans have no name for the whole range, and I therefore think the name proposed by Sven Hedin should be accepted. Until Sven Hedin has had time to work out his observations and plot his map, it would be advisable to postpone any discussion as to the extension of this range east and west; but Sven Hedin has very thoroughly explored it throughout that region marked "Unexplored," on the R.G.S. map of Tibet, and there is no possible doubt that the range exists, and is the watershed between the Brahmaputra on the south and the lake region on the north.

Sven Hedin now carried out a thorough exploration of the Chaktak (called Charta on our maps) Tsanpo; however, near Raga he was met by Tibetan soldiers, and considered it advisable to reveal himself. He at once became great friends with the Tibetans, who allowed him once more to select his own route.\* It was arranged that Abdul Karim, his headman, should go with the main caravan *via* the Samye-la, to meet him again at the Buptsang-tsanpo, while Sven Hedin himself, accompanied by only five men, left his Saka friends on May 6, 1908, and went straight north, to what he describes as the most interesting of his crossings of the Trans-Himalaya range.

By the Gyegong-la he crossed the Kanchung-gangri range, which is not the head range, but broken through by the Chaktak-tsanpo. In the Lapchung-tso, situated to the north of this range, many rivulets coming from the main range collect and form the headwaters of the river. On May 12 Sven Hedin crossed the Sangmo-bertik-la surrounded by glaciers, and the Soma-tsanpo, which he describes as the biggest river in the interior of Tibet, emptying itself into the Teri-nam-tso. On May 19, after crossing the Teta-la, a most brilliant view unfolded itself of the whole Teri-nam-tso, Trans-Himalaya range, Targo-gangri, and Shakang-sham, the latter a particularly magnificent mountain. The lake has been almost correctly placed by Nain Singh, although only from native reports; but his Ngangon-tso nobody had heard of. Two days' march took them to the western end, and following the Soma-tsanpo past Mendong-gunpa, they crossed the Goa-la, and leaving the little Karong-tso to their left, struck one of the great salt roads leading from Raga to Tabié-tsaka. Chunit-tso was left to the right, and a junction should have been made with the main caravan on the Buptsang-tsanpo, in Bongba-kebyang; the caravan, however, had disappeared. On June 5 Sven Hedin said good-bye to his escort and followed the river down to where it joins the Tarok-tso. He was not allowed to visit the great salt depression of Tabié-tsaka, but turned

west, past the Lunkar-gunpa, crossing the Nyapchu-tsanpo, flowing from the Men-la in the Trans-Himalaya range to the Poru-tso. West of this lake they crossed the ice and snow-covered Sur-la range to Rigi-changma, then down the Pedang-tsanpo, a big river, to Shobo-tso. From the Tayep-parva-la one can see nearly the whole of the Nganglaring-tso (wrongly called Chalaring-tso on the map), on which there are five islands, but no monasteries on them as marked on the map. The shape is also wrong, as its length is from east to west, not north to south. They skirted this big salt lake for two days, and reached Selipuk on June 26. Here Sven Hedin was received with the greatest hospitality by the lamas, and, the main caravan rejoining him, he made his way south-west to Tokohen, crossing the Trans-Himalaya range for the tenth time by two passes, Ding-la and Surnye-la. Sven Hedin had at last had enough of Tibet, and he made his way down the Sutlej to Simla, keeping, however, while in Tibetan territory somewhat north of our route.

The geographical results of his journey may be summed up as follows:—

(1) The discovery and careful exploration of the Trans-Himalaya range, and the filling in of the large white space on our maps north of the Brahmaputra from Gartok to Shigatse, and the discovery of the provinces of Bongba and Chokcu, which he has been the first to discover, that of Dokthol, on the map, not being in existence.

(2) The discovery and exploration of the source of the main branch of the Indus.

These, I believe, are two absolutely new and most valuable discoveries.

(3) Sven Hedin also visited and surveyed the true source of the Brahmaputra. This, however, had been approximately located, I think, by Nain Singh, and fairly well surveyed by Rawling and myself, though Sven Hedin having actually visited the real source, his map will be more accurate. I hope this paper, written in a great hurry, may give the readers of the *Geographical Journal* some small idea of the value of Sven Hedin's discoveries and the treat in store for them when he delivers his lecture. He has brought back with him innumerable observations and maps, which will enable him to draw a map of the whole of Tibet and Turkestan on the 1: 1,000,000 scale. Some years must elapse before his scientific report and results can be published, but they should exceed in interest those of his 1899-1902 journeys. In the mean time he will publish as soon as possible a popular account of his travels.

Sven Hedin is not responsible for any opinions expressed in this paper.

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## THE SWEDISH MAGELLANIC EXPEDITION: PRELIMINARY REPORT.

By CARL SKOTTSBERG, D.Sc., Leader.

### IV. EXPLORATIONS IN THE PATAGONIAN CHANNELS BETWEEN THE STRAITS AND THE GULF OF PEÑAS.

IN the original plan, presented to the Royal Geographical Society in Stockholm, I put the limit of our exploration of the Patagonian channels more to the south, for the only reason that I never thought it possible for us to extend our work as far as to the Gulf of Peñas. But as the Chilean Government, with great generosity, offered us the transport vessel *Meteoro*, of 650 tons, during one month, we resolved to reach the gulf. Mr. T. Hall, during this expedition, occupied himself with palæontological researches near Rio Grand (Tierra del Fuego) and on the Brunswick peninsula, where Darwin, on Mount Tarn, made the first discovery of Cretaceous fossils.

At our request Captain José Bordes, of the Chilean Navy, accompanied the expedition. Captain Bordes has great experience of the imperfectly known—partly not even mapped—channels, and his presence was of very great value to us. On May 21 we sailed from Punta Arenas. We first paid an interesting visit to the famous Evangelistas rocks, where stands the important lighthouse at the entrance of the straits. These barren rocks are almost inaccessible, and landing is very difficult, even after several days of calm weather. Situated far to the west, this station was important for the geological survey. After a short investigation of the lately mapped Queen Adelaide archipelago, we followed the track along the channels Smyth, Sarmiento, Wide, and Messier, up to the Gulf of Peñas, where we entered Baker inlet. On our way south we paid a visit to the system of channels west of Messier, explored by a German Government Survey in 1882, and also entered Peel inlet, where, in the south arm, we discovered a splendid harbour, called Port Témpanos, after the numerous icefloes carried there by the tidal currents from the extensive glaciers in the inlet.

We reached Punta Arenas on June 27. During all the time landings were made every day in order to get a complete chain of observations of the geological structure of a vast territory, as well as of the gradual changing of the vegetation. Special care was taken to bring us in contact with all the natives met with during the voyage. I only give the following remarks upon the result of the journey.

#### *Anthropological and Ethnographical Observations.*

One of the principal objects was to study the Patagonian "Canoe Indians," mentioned by all travellers in the channels. As is well known, the southernmost part of South America is, or at least was,

inhabited by three different native tribes—the Onas on the main island of Tierra del Fuego, the Yaghans in the Beagle channel and round Cape Horn, and the Alakaloufs (this is entirely wrong; they call themselves “Álookooloop,” cf. Fitzroy’s “Alakoolip”) in the Magellan straits and the Patagonian channels. The Yaghans have been monographed in the excellent work published by the French Expedition in 1882–83 (‘Mission Scientifique du Cap Horn’). This study was made when the Yaghans still lived in complete liberty. I hardly believe that there is one single family now living in freedom, but the last remnants of the interesting people are collected at the English Evangelical Mission, formerly in Tekeenika, where we visited it on board the *Antarctic* in 1902, now moved to Navarin island; some few individuals I saw at the Catholic Mission on Dawson island. We have thus come to the interesting result of having representatives of the two great branches of Christianity amongst the few members of a dying race, but I doubt very much whether they should be able to discuss the creed. . . .

The Ona people, considered to be related to the Chuelches of Patagonia, and differing much from the Canoe Indians, have been studied by Nordenskjöld in 1895, and by the staff of the *Antarctic* in 1902, when I myself made their acquaintance; and lately Dr. R. Lehmann-Nielsen in La Plata, the well-known anthropologist, has lived amongst them, and is now preparing a complete monograph. The third tribe of “Fuegians,” together with the Yaghans generally called “Canoe Indians” by the English, and here called “Álookooloop,” lives in the channels between the Magellan straits and the Peñas gulf. In the straits very few of them are seen nowadays, some few families pulling down to Port Gallant to sell their otter-skins to an Austrian, who is married to an Indian woman and lives there, or even reaching Otway through the Gerome channel. (Concerning the journey in Skyring, see my former article in this *Journal*.) From the Smyth channel northward the Canoes become more numerous, and we had good opportunities of studying the natives on land or sea, building their huts, repairing their boats, and collecting their food along the beach; inviting them on board, sometimes several families at a time, we made observations on their habits and manners. These Indians have never been visited by any mission, and therefore have kept their old customs. Still they have had some contact with “civilization” in the form of sailors and sealers, people often without conscience or morals—at least, to judge from the result of their influence upon the natives; they have given them liquors and conferred their diseases upon them, making them a miserable lot of beggars instead of a strong race, fit to struggle with a most unfriendly nature and endure the most terrible hardships from their early youth to their grave. We met many an unhappy subject, degenerated with syphilis or consumption, the two prevalent diseases now killing many of the Indians, rapidly

reducing their number. In our voyage we counted some eighty—and I suppose they altogether reach the number of three hundred, or perhaps a little more, not to rely on some doubtful information on “many Indians” living in the channels south-west of the Peñas gulf. We did not see one single Canoe during our short stay in this part.

The Álookooloop are generally considered to be very closely related to the Yaghans. It was thus of importance to try to obtain anthropological measurements also from the former race, and to this object Prof. Retzius, in Stockholm, kindly provided the expedition with modern instruments. It, however, proved very difficult to carry out the work. The glittering steel machines frightened the ignorant natives, and often not even the eloquent persuasion of our old female interpreter could remove their firm belief that we intended to do them harm or even kill them right away. Especially I remember an old stupid cacique in Port Grappler, who, seeing the sharp-pointed edges of the anthropometer directed against his chest, fled in great terror, and strictly prohibited all his people to enter the laboratory, thus spoiling what could have been a good piece of work. We managed to get complete measurements of twelve individuals of both sexes.

It is very astonishing that two tribes having the same aspect and customs, living in the same region and not separated by any natural obstacles, should have their languages so entirely different as the Yaghans and Álookooloops, not one word being the same. As the language of the former people had been skilfully studied by the French, and I wanted very much to collect some materials in order to compare the two, I tried to pick up, from the interpreter who followed us the whole trip, as much as possible of her native tongue. I had, however, to confine myself to a small vocabulary of more important words. It was very difficult, not to say impossible, to get an idea of the grammar, all depending upon Akichakwarrakwiltee's (this word means “the great water,” the name of the place from where the interpreter came; persons are often called in that manner) imperfect knowledge of the Spanish, the neutral ground upon which our spirits met.

In the French monograph Dr. Hyades also publishes a list of words, obtained from two Álookooloop women, who for some time resided in Orange bay. I was greatly astonished to discover that our interpreter did not understand one single word of this list. I hardly believe the author to be so mistaken or misled, that the pronunciation or meaning of the words should be completely incorrect, and for the present I must believe that there has been once some third tongue talked in some part of the region, because I am convinced that it is neither Yaghan nor the language used in the channels from the straits to the north, and only gradually changing a little as to form a southern and a northern dialect.

By means of giving the natives bread, clothing, and some tobacco,

but never liquors, we could bring together a good collection, including canoes, huts, weapons, clothing, and ornaments, household articles, etc. Most of the Indians seem to have given up the use of bow and arrows, and only use harpoons and lassos of different sizes.

*Botany.*—The branch of my botanical studies favoured in this voyage was naturally the phytogeography, and seldom has anybody had such a splendid opportunity as I had to follow the development and gradual changing of the subantarctic flora. With great certainty I am able to tell where the first northern elements appear and where they begin to gain ground, in such a manner that the forest loses its subantarctic character. This change takes place in the south part of the Peñas gulf, where *Nothofagus Dombeyi* replaces *N. betuloides*.

In Peel inlet I could continue the studies I started in Skyring water in order to survey the influence of the glaciers upon the vegetation in their immediate vicinity, and came to the same conclusions. The investigation of the marine flora gave as principal result, that the natural associations I have tried to distinguish in the Falklands and Tierra del Fuego, during this expedition and in 1902, keep their character as far north as we have travelled, though getting considerably poorer in species in the channel region.

*Geology.*—Mr. Quensel, later on, will give an account of the geological structure of the west Cordillera after he has visited certain parts not reached in the voyage referred to above.

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### THE TRIBES OF NORTH-WESTERN SE-CHUAN.\*

We publish in the present number a map showing the routes of journeys in North-Western Se-chuan carried out in 1906 and 1907 by Mr. W. N. Fergusson, one of the British and Foreign Bible Society's agents stationed at Ch'êng-tu. Of the two journeys, that carried out in 1907 (July and August) was the more extended. Mr. Fergusson took plane-table observations over a route which, starting and ending at Kuan Hsien, covered 625 miles of rough country, part of which, so far as is known, had never previously been traversed by any European.

This country, lying to the west of the upper Min river, is occupied by a number of independent or semi-independent tribes, who greatly resent being described either as Fantze, i.e. rebels, a term which finds place on some English maps, or as Mantze, i.e. barbarians, the term usually applied to the tribes by the Chinese. The exercise of Chinese authority is mainly confined to the Ta-chin and Hsiao-chin valleys. Mr. Fergusson describes the country occupied by the tribes as one of the most picturesque that he has ever traversed. Its extent is about 250 miles from north to south and 350 miles from east to west. A

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\* Map, p. 648.

rough estimate gives the size of the scattered population as about a million. The country is drained by rivers and mountain torrents running in every direction of the compass, though the general trend is east and south. There are several prominent peaks crowned with snow all the year round, whose glittering tops can clearly be seen from Ch'êng-tu on a fine day. Highest of all is a peak called by the Chinese Ta-shueh-shan, or the "Great Snow mountain," the height of which Mr. Fergusson estimates to be at least 25,000 feet. Intervening between this mountain and Ch'êng-tu, which lies about 100 miles to the south-east, are the Nuteo and Balang ranges, which, at the passes over which the Mon-gung road winds its way, are from 13,000 to 15,000 feet in height, with peaks rising from 1000 to 2000 feet higher. For the most part the country is well wooded, many of the trees measuring from 4 to 5 feet in diameter, and springing up as straight as a whipstock to a height of over 100 feet.

The territory of one of the tribes, named Wa-shih, comes quite close to Kuan Hsien, but it is difficult of access, being on the opposite side of the Min river, and so wild in character that the borderland is practically uninhabited. As the traveller works his way from Kuan Hsien up the left or east bank of the Min, it is not until he approaches Wên-ch'uan that he gets the first glimpse, on the opposite side of the river, of the stone walls and flat roofs which signify the presence of a people with different habits and modes of living from the Chinese. On the left bank the houses are not so pronouncedly Tibetan in character, but appear to be semi-Chinese. The inhabitants, however, have not the same features as the Chinese, and have a free-and-easy manner with travellers; they are not unfriendly, but preserve a very independent attitude. On this, the left side of the river, the people go by the name of Changming, which Mr. Fergusson interprets as meaning the western or aboriginal tribes. They have long been subject to the Chinese, speak the Chinese language as well as a language of their own, and have adopted many Chinese customs and habits, though retaining their independent bearing. They live in considerable numbers along the left bank of the Min as far north as Mao Chou, and about 5000 families are also to be found among the mountain ranges to the north of Wei Chou.

The Changming, however, are quite distinct from the semi-independent tribes west of the river. Mr. Fergusson enumerates eighteen little states, of which the most populous and influential at the present time seems to be that called Soma, occupying the north-east corner of the country. Various suggestions as to the origin of these tribes have been put forward. By some writers they are regarded as a branch of the Tibetans, others identify them with the aboriginal population, others with the Miao tribes, and others with the Lolos. In 1903 Mr. Fergusson made the acquaintance of the prince, or Tu-ssu, of

Wa-shih, while the latter was on his way to Peking to pay tribute. The acquaintance was renewed in 1906 and 1907, when Mr. Fergusson visited the Tu-ssu's home at Tong-ling-shan, and from this chief an interesting account of the history of his people was obtained. Mr. Fergusson sends us the story in the Tu-ssu's own words—

“About six hundred years ago the Changming were very strong in this part of the country, and the Chinese could not drive them out. At that time our people lived in Tsang-peh (northern Tibet and Chinese Turkestan), and the Chinese invited us to come down and attack the Changming from the rear, while they attacked from the Chinese side. Formerly, when oppressed by the Chinese troops the Changming would retreat into the mountains, and the Chinese could not follow them because of the difficult fords and mountain passes. We came down 6000 strong, for we loved fighting. We came in the back way so that the Changming had to defend their back and front borders at the same time, and after some years of fighting they were overcome. Their chiefs were all slain, and the people who were spared promised to obey China, and they settled east of the Min, while the country they formerly possessed, west of the Min, was given to us. In it we settled, and in time, as we grew stronger, we divided up into tribes or kingdoms. At one time we had forty-eight kingdoms, and we were very strong. Then the Chinese began to get afraid of us, and sent their armies to fight with us. We had many fierce battles; sometimes we were victorious, sometimes the Chinese. Finally, in the time of Kien Lung, the Chinese overpowered us, because we did not all fight together, and they took from us the Hsiao-chin and Ta-chin valleys. This was the most fertile part of our country. The Chinese began to dig and carry off our gold, which grieved us very much. Many battles were fought, but we were not strong enough to drive the Chinese out.

“At first we all spoke one language, but some of our people, being separated by great mountains, got to speaking different dialects. We can all understand one another, but some of our local dialects are very difficult. . . . We are all one family, however. My sister is the wife of the Tu-ssu of Muping; the Tu-ssu of Somo is my cousin; . . . and so it goes on. The daughter of one prince marries the son of another, and as some of the princes have as many as seven wives, they may be connected with many states.”

Throughout his journeyings among the tribes, Mr. Fergusson found this story confirmed by all who professed to know anything about the history of the country, and he concludes that the people are descended from the Hsiao, or Turks, of Northern Tibet. They are not Tibetans, nor do they wish to be called such. Their features are different, and so is their language. They have mixed much with the Tibetans, and have adopted many of their manners and customs, as well as their written language, which has been brought in by the lamas. In the

spoken language many words have been borrowed from the same source, but the majority have no connection with Tibetan. Lamaism has gained a strong hold over the tribes, but it is a form of lamaism impregnated with the nature worship of the formerly prevailing Sakta religion, and in some places the old black temples still attract worshippers, especially in the western states, Ba-ti and Ba-wang.

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### MAP OF PART OF NORTH-WEST RHODESIA.\*

THE map given in the present number is a reduction from one compiled by Captain C. W. D. Lynch, on the scale of 8 miles to the inch, a tracing of which has been kindly sent us by that officer. It is based on route-maps made with prismatic compass, the distances being, in most cases, taken by cyclometer. It appears that, while many of the routes are his own, Captain Lynch has availed himself of other material in the hands of the authorities of North-West Rhodesia, as may be inferred from the large amount of detail inserted over the whole area, which could hardly have been obtained by one individual. He seems, however, to have inserted only such parts of the river courses as have been touched by recent surveys. In order, therefore, to distinguish the precise details for which he is responsible, we have inserted these only in continuous lines, the other portions of the rivers being shown by broken lines, which do not, however, necessarily imply that these parts have not been seen by other travellers.

Although the broad features of the hydrography of this part of the Zambezi basin have been known from the work of Capello and Ivens, Captain Quicke (of Major Gibbons' expedition), Mr. G. Grey, Colonel Colin Harding, and others, the present map will be found to supply more detailed information respecting the courses of the rivers than any previously published. Captain Lynch does not state whether he has made any use of positions determined astronomically, and it has therefore seemed best to adjust his map to the points along the Congo-Zambezi watershed, determined with much care by Major Lemaire during his expedition of 1898-99. On a small reduction of his original map Captain Lynch shows his own route from the Kabompo-Zambezi junction to Kasempa, thence north to the Mombese, and west to the junction of the western Lunga with the Kabompo. This journey has permitted the mapping of the Dongue river, which joins the Kabompo in 24°, but has been but vaguely shown in former maps, and of a considerable portion of the Mombese and middle Kabompo. A good deal of the latter river is omitted from Captain Lynch's map, though we believe that it was descended from its source to its mouth by

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\* Map, p. 648.

Colonel Colin Harding on one of his many journeys in this region. This traveller seems, however, to have passed rapidly down without effecting any survey.

For the spelling of the names we have followed Captain Lynch's map, and a good many variations from the orthography of previous maps will be noticed. Thus the Dongue has previously appeared as "Zongwe," the Mombese as "Mumbeshe," or "Mombeji," the Lifupa as "Lufupa," and so forth. In such cases it is, of course, quite impossible for those unacquainted with the country to pronounce which is the more correct form. Captain Lynch has purposely omitted the names of native villages, as the sites of these are changed periodically. The map is intended primarily as a representation of the river-system, and especially of the distribution of the streams between the basins of the Kabompo and Kafue.

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## DR. STEIN'S EXPEDITION IN CENTRAL ASIA.\*

By M. A. STEIN.

AFTER six weeks of constant toil, I had by the end of July completed at Khotan the sorting and packing of my archaeological collections—a task needing much care, in view of the long journey awaiting them to India and England. Shortly before I had been rejoined by my energetic surveyor Rai Lal Singh, who, after carrying his plane-table survey along the foot of the Tien-shan from Aksu to Kashgar, had subsequently, in spite of great difficulties from flooded streams in the mountains and the summer heat in the barren outer hills, succeeded in mapping the last portions of *terra incognita* on the southern slopes of the Kwen-lun range west of Khotan. On August 1, my heavy convoy of antiques, making up fifty camel-loads (including thirty cases with ancient manuscripts and other records), could be safely despatched to the foot of the Kara-korum, where it was to await me, while I myself, with Rai Lal Singh, started on my long-planned expedition to the sources of the Yurung-kash, or Khotan river. My explorations of 1900 and 1906 had shown me that the true headwaters of the river, confined in deep-cut gorges between high glacier-crowned ranges, were quite inaccessible from the west, where the river has cut its way towards the plain through the rock-bound valley of Karanghu-tagh. I had therefore decided to make a fresh effort from the east, where that wholly unexplored mountain region adjoins the extreme north-west of the high Tibetan tableland. In view of the great difficulties which climate and ground were sure to offer in that inhospitable region, the preparations for this expedition had cost much care and trouble; but for these

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\* Communication from Dr. M. A. Stein, dated "Leh, October 24, 1908."

the complete success attending our undertaking offered ample reward in the end.

After making our way through the difficult gorges of Polu to the northernmost high plateau (circ. 15,000 feet above sea), we turned to the west and succeeded in reaching the deep-cut valley of Zailik, which drains into the Yurung-kash. Here we found extensive gold-pits dug into the precipitous cliffs above the stream, and evidently worked since long ages. They had never been visited by Europeans, and the reticent hillmen of Polu, who so far acted as guides, had done their best to keep us away from the valley. Its discovery proved to us of great value. Terribly rugged and confined as the valley of Zailik is, we managed to ascend from it a series of high spurs coming down straight from the main Kwen-lun range northward, and by establishing survey stations close under its crest-line (which here shows an average of 20,000 feet above sea) to map with theodolite, plane-table, and photographic panoramas the greater portion of the wild mountain region containing the Yurung-kash headwaters. On the south, for a distance of over 60 miles, they proved to be flanked by a magnificent range of snowy peaks rising to over 23,000 feet, and clad with glaciers more extensive than any I had so far seen in the Kwen-lun.

The mines of Zailik, accessible only during a few summer months, are now almost deserted. Yet we managed to secure, among the small groups of miners still toiling in this desolate gorge, that number of carriers without which it would have been impossible to transport our baggage, much reduced as it was, over the difficult marches before us. By crossing a succession of side spurs over passes 17,000 to 18,000 feet high, and subsequently ascending the extremely confined gorge of the main river, we reached, after eight trying marches from Zailik, the great glacier-bound basin (circ. 16,000 feet above the sea), in which the easternmost and largest branch of the river takes its rise. The track we followed was that of wild yaks, and in many places impracticable even for our hardy donkeys, and the crossing of the glacier-fed side streams often dangerous in spite of the advanced season. But excellent survey stations could be climbed *en route* at heights from 18,000 to 19,000 feet, and the opportunities they offered were utilized to the full for survey as well as photographic work. The formation of these rugged mountains and valleys offered abundant geographical and geological interest. A very striking feature was the considerable reduction which the extent of the ice-covered area had evidently undergone during relatively recent times. This observation has its quasi-antiquarian importance, as it helps to explain the contraction which has undoubtedly taken place during historical times in the area irrigated from the Yurung-kash river down below in the Khotan oasis.

Having thus traced the great river to its ice-bound head, we turned east to high but far easier ground on the Aksai-chin plateau, where we

rejoined our dépôt of spare transport and stores. The object now to be accomplished was to follow the great snowy range which we had discovered flanking the Yurung-kash headwaters on the south-east and south, along its southern slopes westwards, until we reached the valley of the Kara-kash river. For this purpose it was necessary at first to follow the route which leads from Polu towards the Lanak-la pass and Ladak. This took us to the uppermost valley of the Keriya river, and past the line of great glaciers which form its true sources. It was interesting here to ascertain that the range from which these glaciers descend is identical with the easternmost part of the great range confining the Yurung-kash drainage. Ever since we had reached the head of the latter very trying weather had pursued us. Frequent snowstorms swept across the high plateaus and valleys, and the slush they deposited soon converted the gentle slopes of detritus into veritable bogs, very difficult to cross for laden animals already suffering from the effects of great altitude and exposure.

At last we left behind the watershed of the Keriya river, and could commence our exploration of the hitherto unsurveyed ground westwards. The area before us, which in extant maps had generally figured as a high plain under the designation of Aksai-chin desert, proved soon of a very different character. High snow-covered spurs with broad valleys between them were found to descend here from the great range flanking the Yurung-kash. The streams brought down by these valleys reach but rarely the series of large lakes and marshes extending at the foot of those spurs; in most cases they lose themselves on vast alluvial fans of detritus above the depressions which connect those lakes and marshes. The direction of these depressions, which all bear signs of having been ancient lake-beds, running from east to west, greatly facilitated our progress. But their increasing barrenness told heavily on our animals, of which, in spite of all care, we lost nearly one-third in the end. Vegetation almost completely disappeared after one march from the first lake, and soon fresh water, too, ceased to be obtainable except by digging wells in dry watercourses.

After a week of long marches from where we had left the Polu-Ladak route, we reached a large salt lake which an Indian survey party appears to have sighted more than forty years ago from a distance, but which has now been reduced to the state of a mostly dry salt marsh. Continuing our journey to the north-west of it over plateaus 15,000 to 16,000 feet above the sea and absolutely sterile, we struck, after three more trying marches, the traces of the old route by which Haji Habibullah, ruler of Khotan at the commencement of the last Turkestan rebellion, had endeavoured to establish direct communication between Ladak and his kingdom. This route, which was followed also by Mr. Johnson on his adventurous visit to Khotan in 1866, had been in use only for a couple of years, and is now completely forgotten. Yet such is the

dryness of the climate in these barren mountains that we found the cairns and other road marks, the fuel stacks and other relics left behind by those early travellers, almost intact. Following these traces and crossing several side spurs of the main range to the north, we emerged at last, on September 18, in the valley of the easternmost feeder of the Karakash. Next day I was joined by a party of Kirghiz with yaks, whom I had ordered from Khotan to await here our arrival.

It only remained now to trace Haji Habibullah's route up to the point where it crossed the high Kwen-lun range. Moving up the side valley which the line of cairns indicated, we found at its head that advancing masses of ice and snow had obliterated all trace of the old route. It was necessary, however, to fix our position accurately with reference to our former surveys from the north side of the main range. So on September 22 I ascended, with Rai Lal Singh and some Kirghiz, a steep glacier pass which seemed to offer the nearest approach to the watershed. The ascent, over miles of ice and *névé* covered with fresh snow, proved very tiring, and it was late when we reached the watershed at an elevation of over 20,000 feet. The fine view here enjoyed showed that we stood at the head of one of the great glaciers descending from the main range towards the valley of Nissa as surveyed in 1906. Mapping and photo work delayed our descent, and when at last camp was reached late in the evening, I found that my feet had in parts severely suffered from frostbite.

It was fortunate that our tasks were now completed, for I soon realized the urgency of proper medical treatment. Moving down the Kara-kash valley, I had the satisfaction of seeing my heavy caravan of antiques safely arrived at the foot of the Kara-korum. Rai Sahib Lal Singh had, during the preceding weeks of trying work, displayed zeal, energy, and readiness to face hardships such as I had never seen equalled by any Indian, and had succeeded since our start from Khotan in mapping no less than 17,000 square miles of mountainous ground. He now took charge of my heavy and valuable convoy, while I moved ahead towards Leh as rapidly as the condition of the passes and my improvised litter would permit. After nine long marches I arrived at the first Ladak village, where Dr. Schmitt, of the Moravian Mission, Leh, kindly met me. After four more days I reached Leh, where he could perform the operation necessary on the toes of the right foot, and where, through his kindness and that of his fellow-missionaries, I was soon provided with civilized comforts. My archæological collections are now on their way to India, where, after a fortnight's enforced rest, I hope soon to follow them.

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## THE RECENT CRINOIDS AND THEIR RELATION TO SEA AND LAND.\*

By AUSTIN HOBART OLARK.

ALTHOUGH long known as an important group from a palæontological standpoint, it was not until the publication of Dr. P. H. Carpenter's two monographs in the *Challenger* reports in 1884 and 1888 that the crinoids were accorded their rightful position as one of the most important classes of marine invertebrates inhabiting the recent seas, a position unique among the creatures of the sea in its relation to questions of geography and thalassography, as well as to geology. Crinoids, as a class, are probably the most strictly sessile of all marine organisms; many of them are stalked and cannot move, and those forms in which the stalk is partially or entirely lost in adult life probably move but very seldom, and not at all unless under strong compulsion. Their free-swimming larval period (so far as we know) is of short duration; the larva soon sinks to the bottom, and becomes fixed. The depth at which most of them live renders them secure from the influence of surface currents; hence we should be able to learn much of value from their distribution upon the sea bottom which we could not gather from the history of any other group. There is no record of crinoid larvæ, other than those of littoral species, having been taken at or near the surface, though I have taken the post-larval stages of ophiuroids and asteroids from shrimps in the Bering sea, caught at the surface over depths of several hundred fathoms. The asteroids and ophiuroids are bottom animals, but the occurrence of their young, in considerable numbers, at the surface indicates a power of dispersal quite unattainable by the crinoids. The extraordinary development of an inorganic skeleton within the crinoid body renders it peculiarly susceptible to preservation as a fossil, hence their great geological importance, an importance which, considering the class as a whole, is increased by the fact that, so far as we know, there are no soft-bodied forms among them.

Geographically and bathymetrically, the recent crinoids fall into three well-marked faunæ, as follows:—

1. *Indo-Pacific Japanese*, extending from East Africa (Madagascar to the Red sea) eastward, including the southern shores of Asia and all the coasts of Australia, the South sea islands generally, and thence northward to southern Japan. Hawaii, the Galapagos islands, and the Pacific coast of South America are not included. The characteristic species are almost all, at least among the unstalked forms, littoral or shallow-water types; they include all the species of *Zygometridae* and *Himerometridæ*; the species of the genera *Comatula*, *Phanogenia*, and most of those of *Comaster* of the *Comasteridae*; *Ptilometra*, *Asterometra*, *Calometra*, and one of the two species of *Tropiometra* of the *Tropiometridæ*; and the species of *Perometra*, *Nanometra*, *Compsometra*, *Thysanometra*, and *Iridometra* of the *Antedonidae*. Among the stalked crinoids *Metacrinus*, *Carpenterocrinus*, *Hypalocrinus*, and *Phrynocrinus* are only known from this region.

2. *Oceanic*, a well-differentiated offshoot from the preceding, and occurring everywhere with it and thence over the entire ocean area, except that it is never found with the succeeding; it inhabits deep water only, from approximately 400 to 2900 fathoms.

Characteristic of this fauna are the species of *Thalassometra* having rounded

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\* The names used throughout this article will be found explained in the author's paper on "The Nomenclature of the Recent Crinoids," *Proc. U.S. National Museum*, vol. 34, pp. 435-542.

and spiny rays and arm bases (such as *T. bispinosa*, *T. villosa*, *T. gigantea*, *T. pubescens*, *T. aster*, *T. echinata*, and *T. multispina*), and certain other species such as *T. flava*, *T. porrecta*, and *T. magnicirra*, *Stylometra*, *Bathymetra*, and *Charitometra*, except the *aculeata*, *hepburniana*, *basicurva*, and *tuberosa* groups; of stalked forms *Rhizocrinus*, *Endocrinus*, and the species of *Bathycrinus* except the *B. carpenterii* group belong here. The crinoids of Hawaii and the Galapagos, all from deep water, are members of this division, as are also those of the West Indies, though a few from the last-mentioned locality suggest affinities which it is not worth while to discuss here.

3. *Polar-Pacific*, embracing the Arctic and Antarctic seas, and the entire Pacific coast of North and South America; in the Atlantic this fauna extends southward to near the Hebrides and the Faroë channel, and to Halifax; in the Pacific it includes the Okhotsk and Japanese seas, and the eastern coast of Japan to Tokyo bay. The Polar-Pacific area is divisible into two well-marked sections, the *Arctic*, including the Arctic regions and the North Atlantic, and the Okhotsk and Japanese seas; and the *Antarctic*, including the Antarctic regions, and the eastern, northern (including Bering sea), and north-western Pacific, but not entering the seas of Okhotsk or Japan.

The unstalked crinoids occurring here belong exclusively to the Antedonidæ; *Helimetra* occurs everywhere; *Thaumatometra* and *Isometra* are found in the Antarctic section only, and *Hathrometra* only in the Arctic. Bathymetrically, the species inhabit moderate or comparatively shallow water toward each pole, but dip downward to a few hundred fathoms when passing under the tropics. The species of *Bathycrinus* of the *B. carpenterii* group (*B. carpenterii*, *B. complanatus*, and *B. australis*) have a distribution suggesting an intimate connection with this faunal division, while the same may be said of *Calamocrinus* and *Ptilocrinus*.

These zoogeographic areas, outlined by the most sessile of all marine organisms, have a certain value as showing the primary distribution of life upon the sea-floor, with the minimum of secondary influences, such as ocean currents and the like. A comparison of the distribution of the crinoids with that of the sea-urchins, the star-fish, and the brittle-stars, shows the difference between practically sessile organisms, and related forms with a free-swimming period of more or less duration, and which are, therefore, more or less susceptible to the influence of currents and other marine phenomena. A careful comparison between the distribution of the deep-sea echinoderms will probably throw considerable light on the question of the deep currents of the ocean areas.

The bathymetric distribution of the crinoids, particularly in relation to their size, and the local distribution of certain species, both geographical and bathymetrical, offer many points of very considerable interest.

It has long been known, in regard to *Antedon bifida* of the coasts of Europe, that specimens taken in deep water are larger than those taken in shallow water, but no plausible reason has been shown for this phenomenon. It has been suggested that the coldness of the deeper water may stimulate it to greater development; but specimens from different localities, taken at a considerable difference in depth but with the same bottom temperature, will vary greatly, those from the greater depth averaging much the larger; similarly, specimens from the same depth, but with a considerable difference in the bottom temperature, will be found to be of practically the same size. Specimens from very shallow water are usually about 120 millimetres in expanse, and from deep water about 220 millimetres, or nearly twice as large, so there must be some factor of great importance brought to bear.

The food of crinoids consists of very small pelagic organisms and minute crustacea; at or near the surface a crinoid must depend upon those which swim

within reach of its pinnules, or which it may intercept by the slow motion of its arms, but in deeper water, while this source of supply is just as available as at the surface, the crinoid gets, in addition, all the carcasses of those which die in the upper levels and fall to the bottom. The intensity of this rain of food increases, of course, proportionately with the depth, so that the deeper a crinoid lives, the greater is the available food-supply; consequently, the better nourished is the individual, and the greater is its size.

The increase in size, proportionate with increase in depth noticed in *Antedon bifida*, therefore appears to be in correlation with the increase in its food supply, and to be a direct result of it. Passing from a single species to a consideration of the group as a whole, it is found that (excluding the large littoral species of the tropics) the average size gradually increases from the shore-line to about the 100-fathom mark; this is plainly due to the increase in the food-supply, as just explained: from 100 fathoms to about 600 fathoms the same size is maintained; but below 100 fathoms plant life, and with it the host of small organisms upon which (as well as upon certain of the minute plants) crinoids are dependant for food, begins to disappear. This gradual disappearance of vegetable organisms is offset by the gradual increase in the rain of carcasses from above, so that an equilibrium is maintained down to about 600 fathoms, and hence the size of the crinoids remains practically stationary from the 100 to the 600 fathom line. Below 600 fathoms the gradual decomposition of the rain of carcasses progressively lessens its food value, and, therefore, a decrease in the size of the crinoids is noticed, scarcely perceptible at first, but soon becoming more marked, until, below 2000 fathoms, we find only the minute comatulid *Bathymetra*, and the equally tiny *Bathycrinus*, and *Hyocrinus*.

By this hypothesis, the general absence of the recent pentacrinites above 100 fathoms is at once explained. The stalked pentacrinites are animals of very considerable size; besides a bulky crown they have a large stem which must be nourished, and the organisms found at or near the surface of the sea are not sufficient; it is not until a depth of approximately 100 fathoms is reached that the organisms in the water about them, plus the cumulative effect of the rain of dead from above, acquires sufficient intensity to admit of their existence. Incidentally their remarkable uniformity in size is also explained, for the pentacrinites inhabit almost exclusively the 100-600 fathom zone, which has just been shown to be a zone of uniform crinoid size. A species of *Endoxocrinus*, *E. wyville-thomsoni*, and the peculiar *Hypalocrinus* both descend to over 1000 fathoms; but both are much smaller than their relatives above the 600-fathom line.

The common Arctic comatulid *Heliometra glacialis* (= *eschrichtii*) occurs from east of the Kara sea westward to west of Greenland, thence southward to Nova Scotia; the southern part of the sea of Okhotsk, and the northern part of the sea of Japan, I found to be inhabited by a variety, *maxima*, differing only in its great size from Arctic specimens. This species varies greatly throughout its wide range; north of Europe it is small, though rather larger around Spitzbergen; off Halifax, and on the Grand Banks, it reaches a comparatively large size; while off the western coast of Greenland it attains a diameter of 500 millimeters or more, reaching upwards of 700 millimeters in the Okhotsk and Japan seas. The west coast of Greenland abounds in fjords which are continually giving off fresh-water ice, which floats off, melting as it goes, thereby killing millions of small organisms which are unable to endure a great change in the salinity of the medium they inhabit; these organisms fall to the bottom, and furnish an abundant supply of food for the crinoids there, which consequently are enabled to attain very considerable dimensions. In the Kara and Barents seas there is no such supply of fresh water at hand, hence the

crinoids are small; but Spitzbergen, through its snowfields, resulting in the freshening of the water about it, allows the crinoids about its shores to reach a larger size than those of the Barents and Kara seas, though they are not nearly so large as are those from West Greenland.

On the Grand Banks, the Gulf Stream brushes by, and mixes more or less with, the cold northern current; this is fatal to the delicate southern life it contains, which is thereby killed and precipitated to the crinoids below; they, therefore, in spite of their living on the southernmost limit of the territory inhabited by the species, are as large as, or larger than, specimens from Spitzbergen.

The Kuro-Shiwo, or Japanese current, sends off a branch through the Korean straits which washes the eastern shores of the Sea of Japan, and in its northern part, from the straits of Tsugaru to the straits of La Pérouse, mingles with the very cold water from the Okhotsk sea. The mixing is very gradual, and extends over a very considerable territory, and over all this area the crinoids are of gigantic size, bearing witness to their enormous food supply. Now this colony of *Heliometra glacialis* var. *maxima*, a purely Arctic species, surrounded in the Pacific by widely different forms, and finding close relatives no nearer than the Kara sea, might be supposed, in the course of the centuries which have elapsed since the Okhotsk sea was a part of the Arctic ocean, to have become rather widely differentiated from the parent stock, and to have attained a very large adult size from some other cause than food-supply; fortunately, we are able to make some observations on other species bearing directly upon the point. In this area *Heliometra* is found where the bottom temperature is very low, about freezing, or below; but, dovetailed into these cold areas are others where the bottom temperature is 40° Fahr., or above, at the same depth. These warmer areas are inhabited by an entirely different fauna, and we find in them entirely different crinoids, belonging to the purely Pacific genera *Thaumatometra* and *Psathyrometra*. It is gratifying to note that the representatives of both these genera are far larger here than anywhere else, the difference, in fact, being relatively greater in both these genera than in *Heliometra*; the three genera are living at the same depth, but at different temperatures and among entirely different surroundings, but their food-supply, coming in a rain from above, is the same, and is, moreover, the only common ecological factor; therefore there is no room for doubt that the food-supply is the cause of the great increase in size.

While the recent pentacrinites as a rule live below 100 fathoms, in certain places, such as in some localities along the northern coasts of Cuba and Guadeloupe, off Amboina, and in Suruga gulf and Sagami bay, Japan, they approach much nearer the surface, having been taken in from 20 to 30 fathoms (Guadeloupe). Now Cuba, Guadeloupe, and Amboina, are mountainous islands, while Sagami bay and Suruga gulf are close to that magnificent mountain Fuji-yama, and to other high land as well. The result is that many intermittent streams flow into the sea at these places, having their origin in the high lands, and the rise in the volume of the fresh water is so sudden that the pelagic life cannot give way before it, but is killed and precipitated. The greatly increased food supply in the vicinity of one of these streams thus brings the food intensity up to such a level, that the large pentacrinites may exist in such localities in much shallower water than would otherwise be possible. The water from these streams is never very great in amount, and does not penetrate deeply, but spreads out over the surface of the sea; thus a crinoid could exist very near the surface without being at all affected by it. The large rivers, on the other hand, freshen the entire sea for a great distance from their mouth, and thus render crinoid life impossible.

Within the tropics, particularly in the East Indies, very large comatulids belonging to the families Tropiometridæ, Zygometridæ, Himerometridæ, and

Comasteridæ occur abundantly in very shallow water, often just below the low-tide mark. Moreover, these decrease in size with depth. This would appear to directly contradict the conclusions reached in the case of *Antedon bifida*, but in reality entirely different factors are involved. Within the tropics the intense sunshine causes rapid evaporation from the surface of the sea, especially where the water is somewhat shallow, and a consequent mortality among the more delicate organisms; the beaches and rocky shores at low tide warm up, to be covered again at high tide with comparatively cool water, full of organisms unable to stand a great change of temperature, which are therefore killed and swept back into the sea, to fall just beyond the low-tide mark. Periods of intense sunshine are relieved by torrential rains, which are just as fatal in their effect on small pelagic life. But torrential rains are associated with mountainous districts; a glance at the distribution of the species of these four families shows that all the large species, and practically all the small ones, occur exclusively about mountainous islands, or near high mainland, and they are particularly abundant along the shores of the larger East Indian islands. On isolated coral reefs and about the shores of low coral islands, where, owing to the low altitude of what little land there is, the rainfall is very small, these large littoral crinoids are quite absent.

The beautiful and brilliant coloration of the crinoids has often been remarked; so striking is the common European species, *Antedon bifida*, that it has been the subject of more coloured plates than any other echinoderm; Heusinger, Gosse, Dalyell, Dujardin, and Dujardin and Hupé have figured it in its natural hues; but the larger tropical species are much more varied and handsome, and are, for the diversity of their colours and the delicacy of their markings, unrivalled among the marine invertebrates. But the rapidity with which the colours fade after death has made it difficult for one not acquainted with the animals in their native habitat to understand them, as the only coloured plates of exotic species are those of Dr. W. E. Leach and Kuhl and van Hasselt, of the comatulids, and Filhol and Alexander Agassiz of the stalked forms. There are, however, numerous records published of the colours in life, and a study of these brings out certain facts of considerable interest. In addition to these published records, I have been so fortunate as to have studied in life nearly one hundred species belonging to nearly all the known genera.

All colours are found in the crinoids, except blue, though black is confined to the disks of the Pentametrocrinidæ, and to lines and spots on two species of *Coccometra* from the West Indies; blue and black, however, enter commonly into combination.

Crinoid colours may be grouped as follows:—

$$\begin{array}{ll} \text{I. Yellow} & \left\{ \begin{array}{l} + [\alpha. \text{ blue}] = \left\{ \begin{array}{l} \alpha. \text{ white.} \\ \beta. \text{ green.} \end{array} \right. \\ \quad \quad \quad + [\beta. \text{ black}] = \gamma. \text{ brown.} \end{array} \right. \\ \text{II. Red} & \left\{ \begin{array}{l} + [\alpha. \text{ blue}] = \left\{ \begin{array}{l} \alpha. \text{ purple.} \\ \beta. \text{ violet.} \end{array} \right. \\ \quad \quad \quad + [\beta. \text{ black}] = \gamma. \text{ crimson.} \end{array} \right. \end{array}$$

Yellow is the colour of all the more primitive forms and many of the more specialized throughout life, and is the colour of small specimens and of pentacrinoïd young of comatulids, with very few exceptions. It probably represents the absence of colour in the group, as it does in the parrots, where the albinos are yellow instead of white as in other birds.

Red, in reality an intensification of the yellow, is the colour of all young which are not yellow.

The black factor in coloration is merely the result of age, and nothing more; all

full-grown crinoids become dusky, sometimes to so great a degree as to obscure the original colour, except members of certain genera which are always and invariably clear yellow.

The blue factor is absent from all crinoids living below 150 to 200 fathoms, but, in the group as a whole, gradually increases in amount from that point to the surface; the first effect of blue is shown in whites and purples, which, as it becomes more intense, change to greens and violets.

Many crinoids exhibit the two basic colours, red or yellow, only; others exhibit these only, but may have more or less of an admixture of black. All crinoids below the limit of light penetration belong to one or other of these classes; thus the deep-sea forms are yellow, brown, red, or crimson. Of the shallower-water species, some are fundamentally yellow, some fundamentally red; the former will be found white, green, brown, or yellow; the latter purple (which may deepen to a dark maroon) violet (which may be almost blue), crimson, or red.

Some shallow-water species, such as *Antedon bifida*, are some specimens yellow, others red, from the earliest manifestations of colour. These when adult will be white, green, brown, or yellow, or any combination of these, or purple, violet, crimson, or red, alone or in any combination.

While this explains the coloration of all crinoids starting from an entirely yellow or entirely red base, certain forms are mosaics, that is, have primarily a mixture of both bases. These mosaics are of two classes; in the first, though both bases are found in the same species, they never occur together; specimens are always either fundamentally red, or fundamentally yellow; *Tropiometra afra*, occurring either yellow or violet, is an example; in the second, both bases occur in the same individual, which is therefore parti-coloured, as *Tropiometra carinata*, which is violet, with yellow blotches of greater or less extent; the latter class, however, always exhibits a tendency toward the former arrangement.

Their analysis of the coloration explains the wide range of hues found in these animals; they appear to be merely the result of light, which introduces a blue factor, on a pigment primarily yellow, more rarely red, plus the effect of the age factor, black. Not only the crinoids, but all the echinoderms appear to obey this law.

A short sketch has been given of the more obvious relations of the crinoids to the ocean currents, to light, to fresh water, and to land areas. Much more might be said; but it is sufficient for the purpose of this paper to show the apparent intimate connection between this strictly marine and almost wholly deep-water group, and geography, in the hope that this line of study, by which many geological problems may be elucidated, will in the future be followed by those interested in the marine invertebrates.

## NEW INSTRUMENTS FOR TRAVELLERS AND SURVEYORS.

By E. A. REEVES, F.R.A.S.

THE following is a brief description of three instruments I have recently designed for the use of travellers and surveyors.

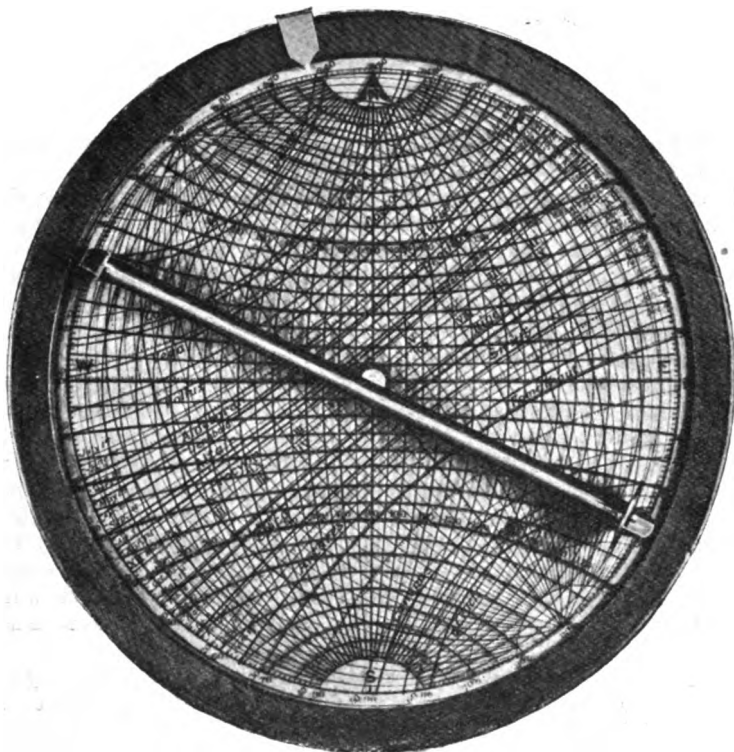
1. *The Distance-finder Alidade for a Plane-table.*—This is a light and portable form of the distance-finder described in the *Geographical Journal* for April, 1908, arranged so as to serve the purpose of a telescopic plane-table alidade as well as for finding distances. It consists of an aluminium ruler,  $2\frac{1}{2}$  feet long, at each end of which is fitted a small telescope placed at right angles to the ruler. One telescope

has a vertical and horizontal wire only, fitted in the diaphragm, while the other, in addition to these, has a movable micrometer wire and drum. In taking a distance the plane-table with the alidade is carefully levelled, and then the telescope with the simple cross-wire is sighted on to a definite point of an accessible or inaccessible object of which the distance is required, after which the surveyor passes to the other telescope, and covering the same point of the object with the movable micrometer wire, he reads off the divisions recorded on the micrometer. To eliminate errors in parallelism, the measurement is repeated with the alidade and telescopes reversed, and the mean of the divisions noted. With this mean a scale on the alidade ruler is entered and the corresponding distance in feet read off. A  $2\frac{1}{2}$ -feet instrument will give direct distances up to about 1200 feet with fair accuracy. By a simple system of similar triangles, distances eight or ten times as far can be measured with very fair accuracy without altering the position of the plane-table. The whole operation is very rapid, and the great advantages of the instrument are that it enables a surveyor to fill in a considerable amount of detail without moving his board, and that he can obtain distances to points which he may be unable to reach. The telescopes can be taken off the ruler, and one of them is fitted with a small circular arc and can be placed in a line with the ruler, when the instrument is used as an ordinary telescopic plane-table alidade.

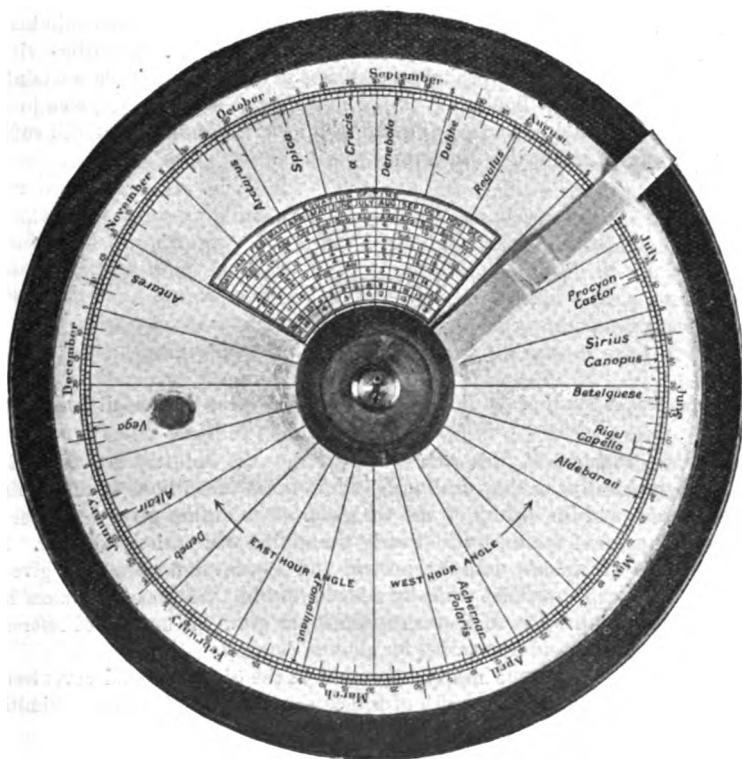
2. *The Astronomical Compass and Time Indicator.*—This is a simple and inexpensive little instrument for quickly finding the north-and-south line and the true bearing of any object, as well as the local mean time by the sun or stars with sufficient accuracy for all ordinary purposes. It has been designed by me to meet the requirements of travellers, and for night-marching, when the ordinary magnetic compass cannot be relied on, as well as to serve as a ready means of checking bearings taken with that instrument.

It consists of two small discs, upon each of which is a projection of a hemisphere drawn on the plane of the meridian. One of the discs shows, in black, parallels of declination of the principal stars and of the sun at different dates, with hour circles subdivided into five minutes, while the other, the upper one, is transparent, and shows, in red, curves of altitude and azimuth. The two discs are centred on a pivot, and the transparent one is weighted at the lower part to keep it vertical. Through the central pivot passes a pin carrying a sight-rule, or alidade, on the front of the transparent disc, and fixed to the handle at the back.

When the instrument is used as a compass, the north or south pole of the declination circle is first set to the red number on the transparent disc equal to the latitude of the place; then, allowing the discs to swing freely, clamped together, a rough altitude of the sun or star is taken by means of the sight-rule. The altitude circle indicated by the pointer at one end of the sight-rule is now followed across the disc until it intersects the curve of declination of the sun or star observed, seen through the transparent disc, and the red longitudinal curve passing through the point of intersection gives the true bearing, or azimuth, at the time. Then, considering the upper disc as a compass-card with the zenith as the true north point, the sight-rule is set to this bearing, counting the degrees round the circumference of the disc. When the discs are now held horizontal with the sight-rule aligned on the sun or star observed, the true north will be indicated by the large red arrow on the transparent disc. There is an additional movable pointer, which can be previously set to any bearing upon which it is desired to march. The lines are all bold, so that they can be read off easily at night. The whole operation is extremely rapid, and bearings at intervals of about twenty minutes or half an hour can be taken without any considerable delay; or, if preferred, after having taken one bearing before starting on a march, the change of



On the compass the vertical and horizontal curves are shown in red.  
*Front.*



*Back.*

REEVES'S ASTRONOMICAL COMPASS AND TIME INDICATOR.

bearing for every half-hour or so afterwards can be marked on the compass, and the alidade set to these marks as the times arrive.

The same observation that gives the true bearing also furnishes *the time*, since the hours and minutes read off the black figures of the declination disc at the point of intersection indicate the hour-angle of the sun or star. This hour angle, of course, in the case of the sun, gives the local apparent time, which can be converted into mean time by applying the equation of time taken from the table at the back, where a diagram is also given, from which the approximate local mean time can be quickly found, without any computation, from the hour-angle of a star taken off, as in the case of the sun.

3. The third instrument is a new form of reflecting *artificial horizon*. It is intended for land or sea use, and, it is hoped, will be of service in polar exploration on moving ice. The special advantages claimed for it over other attempts at the same kind of instrument are (1) that by the system of taking observations, errors are counterbalanced and a good mean obtained. (2) That it can be readily fitted on in front of a sextant when required for use, and afterwards taken off. (3) That no arrangement is required for illuminating wires for star work. Meridian altitude latitudes on land have been frequently taken with this artificial horizon to within 8" or 10" of the truth, and on sea the results should in ordinary weather be near enough to be quite useful.

This artificial horizon is very simple in construction, consisting merely of a reflecting mirror kept horizontal by a short weighted pendulum, of which the weight is slightly below the centre of gravity. The mirror is adjusted to move accurately in the plane of the index and horizon glasses of the sextant by means of adjusting screws, and altitudes are taken in pairs, the artificial horizon being reversed laterally after each observation, and the mean result accepted. This is a special feature in connection with the instrument, and to a great extent eliminates errors. A mean of two or three pairs should give a good result. To reduce vibration, the weighted part of the pendulum oscillates in a small receptacle containing glycerine or other suitable liquid. It is not necessary that the image, seen in the artificial horizon, should be perfectly steady, as a mean of its vibrations will suffice for a fairly accurate result, if taken carefully.

## REVIEWS.

### EUROPE.

#### ENGLISH TIN MINING.

'The Stannaries. A Study of the English Tin Miner.' By George Randall Lewis, PH.D.  
London: Constable & Co. 1908. Price 6s. net.

THE first two chapters of this monograph on the tin industry are most important geographically, as they deal with the technical conditions of tin mining, past and present, and the history of the tin trade. The author gives a number of instances in support of the theory that early tin mining was entirely alluvial. He mentions the wooden tools used by ancient and mediæval miners, and gives a striking example of a complaint made by a landowner in 1361 that the tanners had deluged his land with water so that corn would not grow, an undoubted reference to wholesale trenching and excavating for alluvial deposits.

As the stream tin became nearly exhausted in the sixteenth and seventeenth centuries, shafts were sunk, the depth of which was limited, owing to the primitive

character of mining machinery. Water presented, then as now, the great difficulty of deep mining.

The author traces the gradual development of tin smelting, from the days of the old "Jews' houses," with their primitive furnaces, fed by charcoal, to the perfected methods of the present day. He points out, however, that there is still enormous wastage in the tin industry in this country, and that much work is still being carried on with antiquated machinery, possibly owing to the fact that so many small mines are only worked when the price of tin seems likely to render the labour profitable.

The geographical distribution of tin mining shows that the scene of operations steadily shifted from east to west, Penzance only becoming a coinage town in 1663.

During the Elizabethan period the "craft of Pewterers" monopolized the export of tin, keeping their position largely as a result of the scrupulous purity which they maintained. The final blow to the British monopoly was given by the Dutch importation of cheaper tin from the East Indies. Tin, however, remained one of the most important of British exports down to a later period. For a long time tin was mainly distributed by foreign ships, Marseilles, Bordeaux, Cologne, Bruges, and Italian ports all forming centres of the market; but by the middle of the seventeenth century English carriers had practically displaced foreigners in the export of tin.

A. W. A.

#### THE RHINE.

'The Rhine: its Valley and History.' By H. J. Mackinder. *With Illustrations in Colour after Mrs. James Jardine.* London: Chatto & Windus. 1908. Pp. v. and 226. Maps. Price 20s.

This is a sumptuous volume, in which the illustrations, in the now popular three-colour process, are evidently intended to form a noteworthy feature; and it may be said at once that they do so. The excellence of some of them, within the limitations of the process, could hardly be surpassed, though others (notably some of the winter scenes) are less successful. But Mr. Mackinder's name as author is a guarantee that the text is not (as it sometimes is in books of this character) an appendage to the pictures. His usual admirable choice of words and clarity of phrase is present throughout this detailed physical description of the great river. He traces it from source to mouth, annotating the passage with a study of the leading physiographical features of its valley and banks, and especially demarcating very clearly the strong physical distinction between the several great divisions of the valley. Moreover, there is a description of the places of importance along the river, and their station in history is pointed out, as is that of the river itself; and no one is better qualified than the author for such a historical study. It may be regretted that the book has apparently been passed somewhat hurriedly through the press. Certain errors in the titling of the plates have to be acknowledged; the spelling of place-names in the text and on the plates and maps has by no means been co-ordinated, and such a form as "Basle" should not have escaped emendation. The two coloured maps are in Bartholomew's most excellent style of the coloured-contour system; this system is essential to the proper physical illustration of the Rhine valley, and the maps are one of the most valuable features of an interesting book.

## AFRICA.

## TUAT.

'A la frontière du Maroc. Les Oasis Sahariennes (Gourara-Touat-Tidikelt).' Par A. G. P. Martin. Tome 1, avec 12 gravures et 1 carte. Alger, Edition de l'Imprimerie algérienne, 1908. *Price* 6 fr. 50.

Since Gerhard Rohlfs first visited Tuat in 1864 much has been done, chiefly by French officers, to make that region of the Sahara better known. In 1900, Tuat, Gurara, and Tidikelt, *Les oasis Sahariennes*, as they are officially styled, were occupied by France, and Mons. G. B. M. Flamand and other scientists have published studies on the geology, hydrography, meteorology, and other aspects of the "archipelago." A serviceable monograph on the oases by Commdt. E. Laquière appeared in 1902. Now, after eight years of French rule, we get another study of the region. M. Martin has spent four years in Tuat—and spent them to good purpose. In the book under notice he divides his subject into two parts: (a) history, and (b) an "economic inventory." In the manner now usual (and excellent), his historical study is prefixed by a brief description of the physical characteristics of the Sahara in general and the oases in particular. Incidentally he laments that by *une fantaisie inexplicable* the name "Adrar" has been adopted as the official style of the French headquarters, "Adrar" being the name of half a dozen *ksur* (fortified hamlets) in the archipelago, and the Adrar in question being but one of twenty villages in the district of Timmi. M. Martin explains that Tuat and its neighbours, though directly south of Algeria, remained so long outside the Algerian orbit because of geographical obstacles. They lie south of the Grand Erg, and communicate naturally by the wadis Ghir and Zufana with Morocco. It is with that country that the history of the oases is largely concerned. The historical section (which begins with geological ages) appears well informed, and is clearly told, but for political reasons the Filali period (1504–1900) is left at present in manuscript. The inventory section is full of information concerning the peoples, their racial characteristics, food, dress, and dwellings, the water supply, the administration, the animal and mineral productions, the commerce, and the industries of the oases. Climatic conditions are discussed in detail, and their influence on animal and vegetable life described.

The book, of which we are able to give but an imperfect idea, is animated throughout by that spirit of appreciation of the point of view of the native which is a marked characteristic of the present generation of French officials in North and West Africa. We miss any notice of the achievements of early travellers; the perfunctory bibliography does not even contain the name of Rohlfs.

F. R. C.

## AFRICAN NATURAL HISTORY.

'African Nature Notes and Reminiscences.' By F. C. Selous. London: Macmillan. 1908. Pp. xxx., 356. *Illustrations*. *Price* 10s. net.

This book embodies a collection of notes, in great part not hitherto published, made by the author during the last ten years. In many cases they are retrospective over a longer period than that, and they gain interest in consequence, in view of the rapid change of conditions in Africa from the point of view of the naturalist and hunter. The most important chapters are perhaps those in which Mr. Selous discusses the question of protective coloration of animals, putting forward arguments tending to throw doubt on the correctness of some of the views currently held. The book has an additional literary interest through the presence of a "foreword"

(spelt, it may be presumed, as it came from the writer) by President Roosevelt, at whose instigation the Mr. Selous cast these notes into book-form. Mr. E. Caldwell's illustrations are excellent.

#### ACROSS CENTRAL AFRICA.

'From Ruwenzori to the Congo: a Naturalist's Journey across Africa.' By H. F. R. Wollaston. *With Illustrations.* London: John Murray. 1908. *Price 15s. net.*

This volume is accurately described by its subtitle. It records the impressions of a naturalist in a journey from Mombasa by way of Uganda, Lakes Albert Edward, Kivu, Tanganyika, to the Congo and the West Coast, and during a sojourn under the snows of Ruwenzori. There the author joined for a time, as doctor, an expedition organized by Mr. Ogilvie Grant, of the Natural History Museum. Owing to their unfortunate lack of light tents or any mountaineering equipment beyond an ice-axe borrowed from a predecessor, the English party were unable to explore the highest portion of the range. But they brought back rich results, both botanical and zoological, which have been or will be described in detail in the appropriate Transactions. In these pages Mr. Wollaston confines himself to a popular narrative. His eloquent descriptions of the charms of Lake Naivasha and the natural beauties of Entebbe should attract the tourists for whom provision has now been made by Messrs. Cook. To geographers the most interesting portion of his book is the account given of the relatively little-known highlands lying about Lake Kivu and the Mfumbiro volcanoes. This district is apparently one of the most promising in Africa for European colonization, and it is likely to be opened up in the future by the progress of the Cape to Cairo railroad. Mr. Wollaston describes scenery better than most travellers. He writes rather from an artist's than a topographer's point of view. The dreary belts, the swamps, or the arid monotonous plains so familiar in early books of African travel appear in his book only as interludes between noble tracts of hills and lakes, where every prospect pleases, and man, but for tick-fever and sleeping sickness, might live and prosper. Of the ravages of the latter disease as far south as the shores of Tanganyika, the author gives a most appalling account. The pestilences of the middle ages can hardly have surpassed its horrors. Mr. Wollaston is inclined to attribute the absence of crocodiles in Lake Kivu to the saltiness of the water. But they are also absent from Lake Albert Edward, with the dwellers on which bathing is consequently a frequently enjoyed luxury.

Into purely political matters we cannot follow Mr. Wollaston here; we may note, however, that he agrees in the suggestions put forward in these pages as to the best scientific frontier between the Congo State, and the British possessions. We must also note that in his attempted correction of a passage in the Duke of the Abruzzi's lecture (*Geographical Journal*, vol. 29, p. 131), he convicts himself of a double inaccuracy. He writes that he told the Duke, "not that the high peaks were 'to the west of the watershed'—it was exceedingly unlikely that such high peaks should be away from the watershed—but that they stood on the west side of the range and sloped steeply down into the Semliki valley." The two particular statements would seem to most mountaineers to be identical; they do not usually speak of a peak on the watershed of a range as "on its side." And the general proposition is untenable. In the Alps, or the Caucasus, it would be easy to mention many conspicuous examples that disprove it. It may prevent in the future confusions similar to that recorded by the author (p. 124), if we point out, what is conclusively shown by Signor Sella's panorama, that in the view from Butiti on the Toro high-road the highest peak of Mount Stanley is seen immediately over the top of Johnston's Duwoni (Mount Speke), so that their snows are hardly

distinguishable in morning light. It is very possible that Mount Speke may, as Mr. Wollaston suggests, be the Saddle Peak of some early travellers. What has been disputed and disproved is the existence of the peak inserted by mapmakers under that name from 12 to 20 miles to the north of the central group and equal to it in height. Mount Speke is barely 2 miles from Mount Stanley. The volume is provided with excellent photographs, but once more we must protest against the haphazard way in which publishers have taken to insert illustrations without reference to their place in the text. A sketch-map of the country round Lake Kivu adds something to our knowledge.

## AMERICA.

### LABRADOR.

'A Woman's Way through Unknown Labrador.' By Mrs. Leonidas Hubbard, junr.  
London: Murray. 1908. Pp. xvi., 338. *Map and Illustrations.* 10s. 6d.

The death of Mr. Leonidas Hubbard on October 18, 1903, in the interior of Labrador, evoked additional sympathy owing to its occurrence when the explorer was within a short distance of safety. His wife determined to complete the work he had undertaken. She started from North-West river post on July 27, 1905, travelled up the Nascaupsee river and down the George, and on August 27 reached Ungava bay, having covered 576 miles in this short time, by canoe, with four men. In the present volume we have not only her own narrative, but the diary of her husband, and an introduction, dealing generally with Labrador, by Mr. W. B. Cabot. Mrs. Hubbard's account of the journey is purely narrative, and forms very interesting reading; moreover, with the assistance of excellent photographs, her descriptions give an unusually clear idea of the scenery of the country she traversed. She made certain notes on the geology, flora, and fauna (in the last connection she had the almost unique experience, for a white, of encountering vast numbers of herding caribou). But she also made a running survey, and an examination of the map, in which a reproduction of the outline of the Stieler map of 1905 is overprinted with the course of the two rivers as observed by her, shows the value of her work, especially in the extraordinary divergence between her observations of the course of the Nascaupsee and its course as previously conjectured. Mrs. Hubbard's laudable determination in carrying out the journey can only be inferred, but it can be inferred clearly, from her simple narrative. As to Mr. Hubbard's diary, and the account of his companion, George Elson, who with another left him in order to reach the caché of food which would have saved him from starvation, every circumstance combines to give them pathos, from the enthusiasm obvious in every line of the diary at the beginning, to the knowledge of the nearness of relief and the impossibility of reaching it, at the end. In short, this is a book which, while claiming no great scientific value, cannot fail to interest those who like to read of the doings of pioneer travellers.

### CLIMBING IN ALASKA.

'To the Top of the Continent. Discovery, Exploration, and Adventure in Sub-arctic Alaska.' By Dr. Frederick A. Cook. London: Hodder & Stoughton. 1908. *Sketch-maps and Illustrations.* Price 12s. net.

A narrative, written in a style presumably popular in America, of journeys and explorations on both sides of the Alaska range in the neighbourhood of Mount McKinley, the highest mountain in North America, 20,390 feet, and an account of its ascent. The author states that it was made by himself and a single companion in September, 1906, in eight days from a base camp at a height of 1000 feet, mainly

by the northern ridge. Great difficulties are described as having been met with between 12,000 and 16,000 feet, and the rarity of the air was severely felt in the last 4000 feet. The climbers carried their own luggage and provisions in packs of over 40 lbs. They slept in a silk tent or in snow-huts. The lowest temperature recorded was 16° below zero (Centigrade?). The return to camp occupied four days. The book is written in a sensational style, which does injustice to the feat described. It is well illustrated, but has no adequate map or index. The comparatively large extent of bare and not steep rocks in the photograph representing the summit is remarkable. There are several appendices dealing with the geology and development of the region. It is to be hoped that some further cartographic results of the expedition may be forthcoming. Until these are available it is impossible to follow the orographic details which are somewhat confusedly given.

### POLAR REGIONS.

#### IN SEARCH OF A POLAR CONTINENT.

*In Search of a Polar Continent, 1905-1907.* By Alfred H. Harrison. London: Edward Arnold. 1908. *Price 12s. 6d. net.*

Mr. Harrison, quite single handed, undertook an expedition of extraordinary difficulty. His object was to descend the Mackenzie river to its mouth, then to cross the intervening sea to Banks island in a whaler, to travel along the west coasts of Banks and Prince Patrick's islands, and to discover land, if it exists, between those islands and Siberia.

It could hardly be expected that so great an enterprise should succeed at the first attempt. It is true that Alfred Harrison was, in several respects, well fitted for such an undertaking. With a good constitution, and great powers of endurance, he is also gifted with the faculty of conciliating natives, and adapting himself to his environment. Above all, he is a good observer, and an instructed surveyor, qualifications without which a traveller is useless from a geographical point of view.

The difficulties proved to be insuperable, and the present volume is the record of a brilliant attempt, long persevered in, entailing much hardship, but also rich in the acquisition of knowledge and priceless experience. His journey down the Mackenzie river to Herschel island on the polar ocean, his excursions into the mountains, and his intercourse with the Eskimo are described in detail, and the narratives are agreeable reading. Mr. Harrison tells his story well. The chapter devoted to a careful description of the manners, customs, and mode of living of the two tribes of Eskimo encountered by our explorer is very interesting, and forms a valuable contribution to ethnology, especially as all the facts came under the personal observation of the narrator.

It was in the summer of 1906 that Mr. Harrison, having reached the shores of the polar ocean, made his attempt to cross the intervening ice-encumbered sea and reach the southern coast of Banks island. With this object he embarked on board a whaler, with his sledges and dogs and all his belongings. He was to receive two years' provisions from the whaling fleet. After much delay, owing to being beset by ice-floes, and having to force a way through close pack, Nelson head, on Banks island, was at length sighted, a rocky headland rising to a height of 800 feet. Passing along quite close to the shore, Cape Kellett was reached, where the coast terminates in a low sandy beach. At the season when Mr. Harrison saw Banks island the snow was off the ground. "The whole island," he says, "was a mass of verdure, and it was scored with several beautiful valleys which were full of vegetation, and which extended down to the sea-beach."

Mr. Harrison was unable to proceed further owing to the failure of his arrangements for receiving supplies, and by the middle of August he was back at Herschel

island. His subsequent adventures, in the course of which he had to face dangers and hardships of no ordinary kind, often running imminent risk of death by starvation, are the subject of later chapters which will be read with great interest. They show the explorer to be admirably adapted for Arctic work, while his friendly appreciation of the Eskimo character is a pleasing trait which gives assurance of qualities much needed in the management of natives. With the Eastern Eskimo coercion is impossible. Those alone can manage them who, by patience and good fellowship, have acquired their respect and confidence.

The actual geographical results of Mr. Harrison's arduous labours consist of an exact survey, with astronomical observations, of part of the Mackenzie delta and the adjacent region, including Herschel island and the Baillie islands. Mr. Harrison is full of ardour, and eager to renew his attempt. Indeed, he contemplates an even more ambitious enterprise. His impression is that the assistance of the Eskimo is essential, and he therefore attaches great importance to the intimate acquaintance he has already formed with the two tribes known as Nunatama and Kogmolik. He believes that winter is the best time for travelling, because there is less chance of being stopped by open water. He would, therefore, start in October, taking eleven Eskimo, eighteen sledges, and one hundred and sixty-two dogs, with provisions for two hundred and sixty days. His views respecting diet are peculiar, but evidently calculated with care. His weights would amount to 20,000 lbs., each sledge taking 1200 lbs.

The whole scheme is certainly original. At the same time it is the result of experience acquired under analogous conditions, and it has been carefully thought out. Originality deserves encouragement when it is the result of experience, and it is to be hoped that Mr. Harrison, in organizing his second polar attempt, will meet with the success which his zeal and perseverance so well deserve. Meanwhile his book will be found to be alike instructive and entertaining.

C. R. M.

### GENERAL.

#### EDUCATION.

'Der Unterricht in Geologie und verwandten Fächern auf Schule und Universität.'  
Von G. Steinmann in Bonn. Druck von B. G. Teubner in Leipzig. 1907.  
Pp. 268. Price 1m.

Geology in the regulations for examinations which are in force in Prussia and several other states of the empire, holds a subordinate position, being grouped with mineralogy and chemistry to form a main subject. In 1904 a sub-commission of the Gesellschaft deutscher Naturforscher und Ärzte proposed reforms by which geology would obtain a definite position in education, and the author has been asked to discuss the treatment of geology in schools. He deals with the relation of geology to other natural sciences, and especially to geography. These two he would treat as one subject, and he especially insists on the necessity of excursions, for each of which the pupils should be prepared in school by a description of the natural features of the district they are about to visit, and of its geological structure.

#### COMMERCIAL GEOGRAPHY.

'Commercial Geography.' By H. Gannett, C. L. Garrison, and E. J. Houston.  
New York: American Book Co.; London: G. Philip & Son. [1908.] Price 6s. net.

"Although Commercial Geography is concerned largely with the conditions of interdependence existing among the different parts of the civilized world, the deeper purpose of the study is the discovery of the causes that have been most active in creating these conditions."

This, the opening sentence of the volume, illustrates the change which is in progress in the conception of geography. Simple enumeration of isolated facts is modified by connection and grouping, and this in turn is inspired by the idea of scientific investigation of causes. The ultimate physical principles are rightly treated first, in the chapters on climate and topography in relation to life. Following on this are the conditions of manufacture and transport. Here the treatment is in the main economic rather than geographical, and parts of this section, at any rate, would be more in place in a text book of commerce. In the chapters on soils and vegetable and animal products we are carried back to a more strictly geographical standpoint, though there are occasional insertions describing purely technical processes of manufacture. The authors associate closely the source and character of a commodity with its practical uses.

The second part of the volume deals with the world by countries. Here the necessity of compressing a vast mass of material into a small space has affected the treatment adversely. The enumeration of facts leaves little room for explanation and comment. The arrangement by "countries" marks the limitations inherent in all text-books of this type. The volume is illustrated throughout by physical and political maps, and should be useful for class-work where the teacher can fill in the inevitable gaps; but it can hardly be regarded as a complete illustration of the principles enunciated by the authors.

A. J. S.

#### SHORT NOTICES.

*Europe.—'Washed by Four Seas.'* By H. C. Woods. (London: Fisher Unwin. 1908. Pp. xvi., 316. *Map and Illustrations.* 7s. 6d.) The author tells a straightforward narrative of travel, which carried him from Constantinople inland, through the Rhodope mountains, and into Bulgaria, while he also spent a short time in Asia Minor. As a former Grenadier Guardsman, his opinions on military matters carry weight; as a traveller, he did not by any means confine himself to beaten tracks (if these can be said to exist in Turkey); therefore his book is of much more than casual interest, especially at the present time. One cannot refrain from remark upon his chapter on the scavenging packs of dogs in Constantinople, with their wonderful instincts and habits. An economic and political study of the Turkish railways is given.

*'A Summer Tour in Finland.'* By Paul Waineman. (London: Methuen. 1908. Pp. xvi., 318. *Illustrations.* 10s. 6d.) This book consists mainly of the author's own impressions, but from them we get a clear idea of the characteristic life of Finnish towns, as well as of the characteristic absence of life in much of the country, for Mr. Waineman knows the duchy thoroughly. We may confess to a certain weariness of the unfailing supply of three-colour illustrations which now so often accompany a book of this sort: those in the present volume are crude in colour (which the scenery of Finland is not), and we turn with relief to the half-tone photographs.

*'Hungary and the Hungarians.'* By W. B. Forster Bovill. (London: Methuen. 1908. Pp. xxi., 352. *Map and Illustrations.* 7s. 6d.) We have here a sympathetic study of a country and its people, of which, as the author points out, comparatively little is known in England. On the topographical side we find sketches of the Carpathians, of the plain, of Transylvania, and of the Danube. There is a vivid study of life in Budapest; there are notices of the national customs, costumes, character, and arts (especially music), and of political relations. Mr. Bovill writes of Hungarians as their enthusiastic friend.

*'In the Abruzzi.'* By Anne Macdonell. (London: Chatto & Windus. 1908.

Pp. ix., 309. *Map and Illustrations.* 6s.) The authoress is evidently instinct with the romance of a romantic country. The book is attractively written, and records something more than personal impressions. We have thus a historical retrospect, and a study of the arts, folklore, and religion; while in that part of the book which deals with the writer's travels, she makes frequent reference to the antiquities and history of the places visited. Her language of description is well chosen. In this book, as elsewhere, the three-colour reproductions probably do injustice to the water-colour originals.

*America.*—'A Historical Geography of the British Colonies.' Edited by Sir C. P. Lucas. Vol. 5. "Canada: Part II., Historical." By H. E. Egerton. (Oxford; Clarendon Press. 1908. Pp. viii., 365. *Maps.* 4s. 6d.) The names of author and editor are sufficient justification for acknowledging this volume as a contribution of the first importance to imperial literature. It is divided into three parts, respectively entitled "The Separate Provinces," "The Union," and "The Dominion," a division suggestive of the admirable arrangement of the whole. Authorities are cited for each section.

## THE MONTHLY RECORD.

### THE SOCIETY.

**Gift of a Portrait of David Livingstone.**—The Society has received from Mr. James L. Hardcastle, of Bishop Stortford, the gift of a fine portrait, in oils, of David Livingstone, painted by General Charles Need during the explorer's lengthened stay (1864–5) at Newstead Abbey (the residence of his friend Mr. Webb), after his return from his second expedition to the Zambezi. Fountain Dale, the property of the Need family, adjoined Newstead, and it is believed that the general painted the portrait at the same time that the picture now at Newstead was painted by another artist. The later history of the portrait is as follows: From the possession of General Need it passed into the hands of the late Mrs. J. A. Need, who died on March 29 last, leaving the portrait by her will to her brother, Mr. J. L. Hardcastle, above mentioned, for life. It was her intention that it should ultimately pass into the hands of the Royal Geographical Society, an intention the realization of which has been generously anticipated by Mr. Hardcastle.

### EUROPE.

**Distribution of House Types in Germany.**—In *Deutsche Erde*, 1908, Nos. 1 and 2, we find an interesting ethnogeographic study in the form of a discussion on the division of the Empire into "house-type districts." The chief of these is that of Middle Germany, which extends throughout the north German plain from Belgium to Russia. The characteristic country house is called after the region. It is a large timber-framed building with a diagonal-shaped room taking up the ground floor, and often containing two fireplaces, one for the oven, whence it is called the "two-fire house." In the Rhine provinces the gable is generally turned

to the street. On the other hand, in Lorraine the houses are joined together along the street, with small frontage, but with great depth. In Bavaria one finds wooden houses in the valleys built like a quadrangle with one side open. The article is accompanied by a map showing the distribution of types of houses in Germany.

**Shakespeare and the Waterways of Northern Italy.**—While fully alive to the intimate knowledge of Italian life, customs, and ceremonies shown by Shakespeare, commentators have reproached him with ignorance of Italian geography, basing this verdict on supposed mistakes respecting the relation of various cities of Northern Italy to the sea. In the *Two Gentlemen of Verona*, *The Tempest*, and *The Taming of the Shrew* passages occur which have been supposed to imply that Shakespeare regarded cities like Verona, Milan, or Padua as seaports. That this accusation is far from merited is maintained with considerable force by Sir Edward Sullivan, in an article contributed to the *Nineteenth Century* for August last. Thus, attention is called to a passage in the first-named play, which seems unaccountably to have escaped the commentators, in which express mention is made of the river (*i.e.* the Adige) in connection with the voyage under discussion. In fact, the writer considers that the passages in question indicate Shakespeare's accurate knowledge of the system of river navigation which was in use in his time and long before it. He points out that "a volume might easily be filled with extracts from chronicles, social records, and other writings to show the importance attaching to these inland water-routes in the eyes of statesmen, merchants, and private persons in early Italian days." To illustrate the state of things at and before Shakespeare's time, he gives many interesting quotations from contemporary documents, bearing on the active traffic maintained in those days on the Po and other waterways, including the navigable canals which led out of Milan in various directions, and which caused a writer in 1520 to state that Milan, far as it was from the sea, might easily be taken for a seaport town. In reference to another supposed instance of geographical ignorance on Shakespeare's part in locating a shipwreck in Bohemia, the writer points out that at an earlier period, and that the most important in its national existence, Bohemia possessed, not one, but two coasts, the dominions of Ottocar II. extending from the Adriatic to the Baltic.

#### ASIA.

**Journey in Western China.**—In connection with Mr. Fergusson's map of a portion of Western Szechuan given with the present number (see pp. 594, 648), it may be of interest to quote some items from the narrative of a journey through part of the same region, sent to us early in the year by Mr. T. Smith, of the Szechuan University at Chengtu. Mr. Smith made the journey from Kuan Hsien to Tachien-lu in July, 1907, by way of the Great and Little Gold rivers, in company with Mr. J. H. Edgar. The route, which in part, at least, is used as a trade-route, seems to be the same as that followed in 1904, in the reverse direction, by Sir A. Hosie, and described by him in a Parliamentary Paper (China, No. 1, 1905; *Journal*, vol. 26, p. 452). The difficulties of travelling through the narrow ravines and over the steep and high passes followed by the route are vividly described by Mr. Smith. In the eastern section the mountain sides and crests were covered with dense dripping forest, and coolies were seen carrying huge logs down the steep and slippery paths, this region being the source of supply of the timber used at Chengtu and other cities of the plain. It is rafted down to the Min from a point called San Kiang Keo (three river-mouths). Mr. Smith took boiling-point observations for altitude, and he gives the heights obtained for the principal passes, which are, however, considerably in excess of those shown on Mr. Fergusson's

map, and, being unchecked, can only give a rough approximation to the truth. The Nu-teo pass is put down as 10,559 feet, and the Ban-lan-Shan (Balang Shan of Mr. Fergusson) as 15,361 feet. After crossing the latter the road soon enters the small native state of Orih (Oirh of Fergusson), and the traveller speaks in glowing terms of the clearness and purity of the air, the beauty of the scenery, and the luxuriance of the crops in this favoured valley, which created a more favourable impression than anything seen elsewhere in China. After reaching the Hsiao Kin-ho, or Little Gold river, the road enters the "Four Colonies." Here the settlements of the Chinese and half-castes are in the valley, while the Mantse natives dwell in villages perched high upon the mountain-sides. Romi Changu, near the junction of the Great and Little Gold rivers, is a rambling town of about one hundred and forty families, with several lamaserias. It is shut in by high bare peaks, which reflect the heat till the place seems like an oven. Goitre is prevalent there. The further route led over the Tao Pao Shan, the height of which is given as 15,800 feet. The upper part of this pass is open grass and scrub land, but the final ascent is steep and trying for horses. Over the greater part of the whole route population seems to be scanty.

**Population of Peking.**—We have received from Mr. Rockhill details of the last census of Peking, compiled by order of the Board of the Interior, which puts the total population at a far lower figure than some previous estimates. The census is given, by families, for each of the police districts into which the inner and outer cities have now been divided. The total for the three precincts of the Inner or Tartar city is 79,009 families, and that of the two precincts of the Outer or Chinese city, 46,999, giving a grand total of 126,008. This, on the basis of 5.5 individuals per family, gives a total population of 693,044. A census of schools (boys' and girls'), scholars, teachers, and school officers, is also given for each district.

**Physical Features of Sakhalin.**—Since the acquisition by Japan of the southern part of Sakhalin, something has been done by Japanese geologists to improve their knowledge of the structure and geological formations of the island. Work in this direction has been done by Messrs. Kawasaki, Katayama, and Jimbo, the first of whom has presented a report, in Japanese, on the mineral resources of the island, which includes a general topographical and geological sketch, and embodies also some of the work of the other two observers. The results of these researches have been made more generally available by a summary in English, contributed by Mr. Jimbo to the *Transactions of the Sapporo Natural History Society* (1908, No. 2), of which we have received a reprint. The writer points out that Sakhalin consists of two longitudinal mountain ranges, separated from each other by the median line of depression. The latter is formed by the valleys of the Susuya and Takoi rivers in the south and of the Poronai and Tuimi on the north, and supplies a natural line of communication from north to south, though the former road on the west side of the Poronai has long been abandoned. The eastern zone of highlands consists largely of Palaeozoic rocks and crystalline schists, with less extensive Tertiaries and Cretaceous, besides eruptive rocks. It is formed by the north-eastern mountain land, east of the Poronai, and the Susuya mountains between Shiretobo and Dubki. A lake region included in the latter may represent a minor line of depression. The western zone consists essentially of Cretaceous, Tertiary, and volcanic rocks, as well as older eruptives. The Russian part of the island is less known, but a remarkable contrast exists between the valleys of the Tuimi and Poronai, in that the former is narrower and is covered with woods and grasses in place of the tundras which mark the latter. A great similarity can be traced between the two mountain zones in Sakhalin and in the island of Hokkaido (Yezo), but in the latter the Cretaceous terrains on the west side abut on the axis of old

rocks, the median depression being absent. Mr. Jimbo describes in turn the main topographical features of Sakhalin, beginning with the median depression, for a knowledge of which his survey of the whole Japanese portion of the Poronai has been of considerable importance. Up to Poroto it is navigable for a small steamer of 4½-foot draught. In its valley, besides the tundras, there are forests of poplars, birches, larches, and other conifers. No definite evidence that the median depression is due to faulting has yet to be obtained. The two ranges present a marked contrast in their topographical as in their geological features, the eastern being the more rugged. That on the west is remarkable for the straightness of its coast-line, which affords little shelter to ships. Part shows a terrace formation, which is seen also on the east coast. The mountains on both sides are almost everywhere covered with dense forest. The valleys have gently sloping sides, and are clothed with tall grasses. Recent surveys show that the height of the mountains has been very incorrectly estimated, the highest elevations in the east and west being probably about 3000 and 4000 feet respectively. No peaks seem to reach the snow-line.

#### AFRICA.

**The Boundary between Abyssinia and British East Africa.**—The mutual frontier of Abyssinia and the Anglo-Egyptian Sudan was defined by the agreement of May 15, 1902, which traced the line in question as far south as the intersection of 35° E. with 6° N. lat. (*Journal*, vol. 21, p. 186 and map). No arrangement was then arrived at respecting the southern frontier of Abyssinia, on which side the British East Africa and Uganda Protectorates were the other parties concerned. This southern section was at last defined by an agreement signed at Adis Ababa on December 6, 1907, but only printed as a Parliamentary Paper in October last. Beside the text of the agreement, there is a map in two sheets based on the surveys of Major Austin and Captain Maude, from which the accompanying sketch (see next page) has been prepared. Little explanation is necessary, as the natural features by which the course of the line is determined are plainly marked on it. It should be mentioned, however, that the point on the Dawa where the line leaves that river is given in the agreement as Ursulli, which is marked on the accompanying map (with a query indicating uncertainty as to its exact co-ordinates) as opposite to the place Chuffa Kulumi shown on our sketch. From the creek at the south end of Lake Stefanie the line runs due west to Lake Rudolf, while the point at which it leaves the latter is defined as "the mouth, or marshes at the mouth, of the river Kibish (river Sacchi)." This last is left in lat. 5° 25' N., and this parallel is followed to 35° 15' E. This meridian becomes in turn the boundary up to its intersection with 5° 40' N., beyond which a straight line is drawn to the termination of the Sudan Abyssinian frontier in 6° N., 35° E. It may be mentioned that the parallel of 6° is definitely shown on the map of Abyssinia lately issued by the War Office as the boundary between the Sudan and the Uganda Protectorate, and that the starting-point of the new frontier on the east is also that of the boundary between Abyssinia and Italian Somaliland, as defined by the treaty of May last.

#### AMERICA.

**Changes in the Bogoslov Islands, Bering Sea.**—Reference was made in the *Journal* (vol. 29, p. 228) to the formation of a new island in this group in 1906, but until lately no clear account had been available of the precise nature of the changes which then and subsequently affected the locality. This has been supplied by an interesting paper printed in the *Bulletin* of the American Geographical Society for July of this year, entitled "The Evolution of the Bogoslov Volcano."



The author is Mr. T. A. Jaggar, who visited the scene of the disturbances in April, 1907, on behalf of the Massachusetts Institute of Technology. The course of events from March, 1906, onwards is clearly described and illustrated by photographs and sketches. It will be remembered that the first Bogoslov island appeared in 1798; the second, a little to the north of it, in 1883; the former being sometimes known as Castle rock, the latter as Grewinck. When Lieut.-Commander Garrett reached the locality in May, 1906, he found a steaming cone midway between the two older islands.\* It was connected with Grewinck by a low flat ridge, but separated by a channel from Castle rock. The summit showed a broken horn bending to the north-east, indicating that the mass had been forced up through an aperture in a plastic condition, and thus recalling the Pelée tower which attracted so much attention after the Martinique eruption in July, 1906. This cone (which had been named Metcalfe cone by Garrett) had a solid rock core, and the salt-water lagoon, which half encircled it on the north, had a temperature of between 70° and 90°, the steam vents giving temperatures of from 94° to 212°. In the spring of 1907 it was reported that still another peak had arisen, and this was found to be the case when the cutter *McCulloch* visited the scene in July of that year. Half of Metcalfe cone had by that time collapsed, while the channel between it and Castle rock was filled up with the new steaming heap ("McCulloch peak") and a wide stretch of gravel wash. The observations of the expedition of the Institute of Technology showed that the whole group formed a continuous mass above tide-water about 2 miles long, with the two new steaming cones in the middle 400 to 500 feet high, the intervals between these and the older islands being filled with sand, gravel, and volcanic bombs, though McCulloch peak was almost encircled by a hot salt-water lagoon. The portion visible above the sea was, however, only the top of an immense submarine heap of lava 6000 feet high. On the rocky wall of Castle rock evidences of recent elevation were seen, the conclusion being that either a larger mass of lava was spreading itself out below and lifting the volcano on its back, or that the whole sea-floor was slowly warping upwards. On September 1, 1907, twenty-four days after the expedition had left the spot, the inhabitants of Iliuliuk saw a dense black cloud rising towards the west, and ash and sand soon began to fall. The *McCulloch* visited Bogoslov in October, and found that McCulloch peak had entirely disappeared, its place being taken by a steaming lagoon, though the half of Metcalf cone was still standing. Mr. Jaggar suggests that the dome and spines which first rose above the sea as Metcalf cone were the top of a body of hard lava rising within an earlier solidified crust of its own substance. The central streams subsequently moved up and out, bending over and forming the striking protuberances and carapaces observed. Eventually there was only a small pencil of lava pushing up in the middle. He also suggests that the continued upward pressure opened ways by which the ocean water entered, causing explosions which destroyed what had before been built up.

**The Tumuc-Humac Expedition in Dutch Guiana.**—The expedition of 1907, under the command of Lieut. de Goeje, travelled from Majoli on the Palumen, or upper Tapanahoni, to Apikollo (in 2° 6' 53" N. lat. and 56° 16' 40" W. long.) and the Sipaliwini, twice crossing the mountains which here make a curve to the north. During the first passage of the mountains, a peak named Alimi-muni, nearly 2500 feet high, was observed, and the drainage basin of the western Paru was entered. The Sipaliwini, a stream some 30 yards broad near Apikollo, is said by the Trio Indians to unite with the Kutari and Kulunti, and is most probably the

\* The Ship rock of Captain Cook, which also occupied a position between the sites of the two islands, seems to have disappeared before this date.

Sipariwuni of Schomburgk, a tributary of the Curuni. The whole country is covered with forest except a small savannah at the head waters of the Paru and one of somewhat greater extent near Apikollo. The name Tumuo-Humac is unknown to the natives, and its origin is unknown. In the *Tijdschrift* of the Dutch Geographical Society for September last there is an account of the expedition, illustrated by a map and profile, together with a map on a smaller scale showing the geography of the whole Dutch colony as now known. Full details are given of the cartographical materials used and of the astronomical observations made by other travellers, and appendices deal with the language of the natives and the geology. Specimens were collected of granite, quartz-porphry, porphyrites, and sericite schist.

#### AUSTRALASIA AND PACIFIC ISLANDS.

**The Ben Lomond Range, North-East Tasmania.**—We alluded early in the year (vol. 31, p. 109) to recent observations in this imperfectly known range, taken with a view to determining its highest point. We have since received from Colonel Legge, who has taken a foremost part in the exploration of the range, the summary of a paper on the physical features of the Ben Lomond plateau, read by him last year before the Australasian Association for the Advancement of Science, together with a note on his two expeditions of 1906 and 1907. Ben Lomond forms the trunk from which two plateau-like areas, averaging 2000 feet in altitude and crowned by tor-like summits, reach out to the north-west and north-east respectively. The mountain chain so formed is entirely separated by the South Esk river from those of Northern Tasmania. The climatic conditions of this part of Tasmania are much affected by the range, which during westerly weather shelters the country to the east and south-east from the heavy precipitation on the opposite side, the contrary conditions obtaining during heavy easterly weather. The plateau is completely surrounded by a precipitous diabase escarpment which rises from the surrounding "tiers," and supports it at elevations of from 4500 to 5000 feet. Topographically the surface is divided by a deep depression into two main divisions, from the southern of which the Nile river issues by a profound gorge in the western escarpment; its source lying in a lake near the eastern escarpment. Nearly all portions of the upland are clothed with an interesting alpine vegetation, few low-country forms being found except on the slopes of one valley, to which *Eucalyptus viminalis* has made its way from below. The dominant plants are four species of *Richea* or "honey-plants," two of *Orites* or "yellow-bush," two of *Olearia*, one *Ozothamnus*, *Bellenden montana*, and the mountain "ti-tree." The mountain currant, *Coprosma nitida*, persists in a stunted habit to the topmost peaks of the northern division.

**German Research in the Western Pacific.**—Great activity is at present being displayed by the Germans in the direction of scientific research in their possessions in the Western Pacific. In addition to various expeditions already referred to in the *Journal*, one which has been despatched by the "Landeskundliche Kommission" for the German Colonies (the organization which has also carried out much good work in East and West Africa), under Drs. Sapper and Friederici, has secured some interesting results (*Deutsches Kolonialblatt*), Nos. 15, 20, 21, 1906). After geological and ethnological work in New Hanover (which is described as very uniform from these points of view, though more varied as regards its surface features), the travellers proceeded to New Mecklenburg (New Ireland), crossing and recrossing the Schleinitz range in the western half of the island. Dr. Sapper then proceeded to Bougainville in the Solomon group, which was traversed from coast to coast, the mountain range being crossed by a pass over 4500 feet high. Here too

the geology was found to be very uniform, the island consisting mainly of recent eruptive rocks, while no fossils were met with in the scanty sedimentary formations. Smoke was seen to issue from the two volcanoes, Balbi and Bagana, and whereas that from Bagana was carried north-west by the south-east trade-wind, that of the higher Balbi was driven eastward by the anti-trade. Many of the inhabitants had deserted their dwellings, but offered no molestation to the party. Dr. Friederici had meanwhile continued his ethnological work on New Mecklenburg, and had also visited Gardner and Fisher islands, to the north. Having failed to meet Dr. Sapper, he completed his researches in New Mecklenburg by various journeys in and across the south-eastern part of the island, which was also investigated by Dr. Sapper, who crossed it from west to east, besides following a good part of its coast-line. Coal was found near the south-east coast, but the traveller is not sanguine as to the possibility of its exploitation. Some further details respecting the journey across Bougainville are given in No. 21 of the *Kolonialblatt* in a report by the governor of German New Guinea, in whose company Dr. Sapper travelled. This seems to have been the first occasion on which the island was crossed by Europeans.

#### POLAR REGIONS.

**A New Norwegian Arctic Expedition.**—Plans for a new Arctic expedition, which promises to be one of the most important taken in hand for some time, are being developed by Captain Roald Amundsen, whose successful expedition to the North Magnetic Pole, leading to the achievement of the long-sought north-west passage, marks him as particularly fitted to carry through a further work of the kind. The project is warmly supported by Dr. Nansen, who sends us some details as to the probable arrangements. His own famous voyage in the *Fram* will serve to some extent as the example to be followed, for the central idea is the utilization of the drift of the Arctic ice for the transport of the ship across the Polar basin. Captain Amundsen, who is applying himself to the task with the same energy and thoroughness as marked the organization of his former expedition, proposes to pass through Bering straits and enter the ice to the north-west of Point Barrow, drifting thence across the Polar sea. He contemplates the possibility that five or even six years may be needed to accomplish the whole voyage, and he will be fully prepared for this eventuality. Oceanographic investigations of various kinds will be carried out during the voyage, and Dr. Nansen points out that nowhere else are the conditions for solving the problems connected with the circulation of the ocean so favourable, while important geographical results may also be expected. The Norwegian Government will propose to the Storting that the *Fram* be put at the disposal of the expedition, and that such repairs be executed as may be needed to put her in perfect condition for the voyage. It is hoped that Captain Amundsen may come to this country towards the end of January, and that he may explain his plans and invite discussion of his project at an evening meeting of the Society.

#### MATHEMATICAL AND PHYSICAL GEOGRAPHY.

**Visibility of Mountain Summits at Great Distances.**—In a note in *La Géographie* (July, 1908, p. 39) M. Paul Girardin calls attention to a recent case (October 18, 1907) in which the summit of Mount Blanc was seen with great clearness across the chain of the Jura from the Marseilles express while leaving the railway station at Dijon. The distance is 220 kilometres (136·7 miles) and it is only on rare occasions that the conditions are such as to permit the mountain to be seen at this distance. The day in question, although dull, was marked by unusual clearness of the atmosphere, due to the rainy weather which had preceded it. M.

Girardin mentions other authenticated instances of the visibility of mountains from long distances, though in some of these both extremities of the visual ray have been at some elevation above sea-level, whereas in the case above mentioned the viewpoint was on the plain, only 243 metres (797 feet) above the sea. Mount Canigou has been seen from the heights which dominate Marseilles, at a distance of 253 kilometres (157 miles), though it is only when the range is projected on the disc of the setting sun, in February and October, that this is possible. Again, Mount Blanc has been seen from the Puy de Dôme at a distance of 303 kilometres (188 miles). Long distances have been covered, as is well known, by observations during geodetic operations, such as those for the linking of the Balearic islands and Corsica with the mainland of Europe, or for the junction of the surveys of Spain and Algeria, carried out by General Perrier in 1879. M. Girardin adds some simple formulæ for the calculation of rays of visibility, though these presuppose the use of metric units, and would of course not be applicable without modification in the case of English measures.

**The Accumulation and Storage of Moisture in the Soil of Rivers of the Plains.**—Mr. Oppokov has studied the relationship between the precipitation and discharge of the Dnieper above Kiev during the twenty-nine years 1876–1905, and has summarized his conclusions in a paper presented to the Eleventh International Navigation Congress at St. Petersburg (St. Petersburg, Société d'Impression artistique, 1908). Briefly stated, they are as follows: (1) During dry years there is a consumption of moisture stored in the soil which is lost by evaporation, and this consumption has to be supplied during the first wet year which follows one or more dry years. (2) This consumption and storage amount to about 135 millimetres, and equals the mean annual discharge of the river. (3) The amount of evaporation, especially in dry years, may be greater than the difference between rainfall and discharge, but in wet years, especially those which follow dry years, it is less. (4) Hence the discharge percentage is high during years of drought when compared with that during a wet year immediately succeeding a dry period. This is due to the slow movements of subterranean waters in flat regions, and the very gradual change in their condition, which does not affect the flow of the river for a year. (5) The forest and marshes of the river-basin are the most powerful agents of evaporation. Their influence on the discharge in the summer of a dry year is to diminish the discharge, and this may be traced even in a wet year which succeeds a dry period. (6) The rôle of the forest varies with the geographical and climatic conditions in general and the climate of a particular year. In the normal year in Central Russia this influence is zero, but in dry years in the centre, and in all years in South Russia, it diminishes the discharge, while in wet years in the centre, and in all years in the south, the forest probably stores water. (7) Marshes in the area studied have no influence in a normal year, but diminish the discharge in dry years. Hence the drainage of marshes by diminishing evaporation helps a river. (8) Sandy porous soils are the most important agent in supplying underground water, not merely to rivers, but to marshes. Mr. Oppokov asks for observations in other river-basins.

**Mountain Passes.**—In the *Forschungen zur deutschen Landes- und Volkskunde* (vol. 17, part 2), which, since the death of Prof. Kirchhoff, has been edited by Dr. F. G. Hahn, Professor of Geography in Königsberg University, there is a classification by Dr. Solch, of Vienna, of mountain passes in general, with particular reference to those of the Eastern Alps. The author begins by discussing the idea underlying the term "pass." This differs in its morphological acceptance from the connotation of its geographical definition. The latter has special connection with the use by mankind of passes as lines of communication. Traffic passes, as they

are called, have various origins. They are concentrations of routes through swamps, deserts, and mountain chains. They are found along sea-shores, and may be described as local or central. Morphologically, they depend upon the type of their approach valleys. Some pass over mountains, while others are deep trenches cut through. The Splugen and Bernardino are examples of the latter. Prof. Davis's theory of the geographic cycle includes the phenomena of old and young land forms. The former class exists in the trunk passes of Styria and the Eastern Alps. Heim suggests that running water is one of the chief agents in the formation of gaps through mountain chains, but many passes in the Alps must date from the ice age. Other factors in the formation of such thoroughfares are petrographic and tectonic. Foldings and faultings which give rise to Schollenlands like the highlands of south-western Germany, have their own type of valley, which differs from the smoothly sloping trenches due to fluvial erosion. The Alps are characterized by the action of glaciers which have ground channels for their outflow through both hard and soft rocks. Their courses are marked by perched blocks and masses of morainic material, and are therefore more difficult of passage than fluvial or tectonic passes. They are generally more deeply cut, and not so high in comparison with the mountain summits or crests, through which they can be followed. The degree of accessibility of a pass may be said to be a function of its age. Glacial action is traceable in the routes through the Pyrenees and the mountain system of Scandinavia. In the case of the former political considerations prevent them from being used as much as are those of the Alps. Destructive processes are thus characteristic of old mountain systems, but the very remoteness of their beginnings cause the geographer to be content with hypothesis rather than with certainties. There are some interesting photographs of the Bernina and Julier passes, with diagrams and a bibliography.

#### GENERAL.

**Bird Migration.**—Interesting experiments with a view to throwing light on bird migration have lately been carried out by the authorities at the "Vogelwarte" at Rossitten, on the Kurische Nehrung, in East Prussia. Young half-fledged storks have for some time been marked by means of an aluminium foot-ring, the number so treated having reached a total of some 1800 (*Deutsches Kolonialblatt*, September 15, 1908). Two such marked birds have been reported from widely separated parts of Africa, the first, which commenced its southward flight in August, 1906, having been captured by natives on the northern shore of Lake Fittri, in Wadai, in October of the same year. The ringed foot came into the possession of a French officer, Lieut. Loisy, by whom it was forwarded to Rossitten. The second bird had accomplished a far longer flight. Its ring had been attached in July, 1907, near Gross-Möllen, in Pomerania, and it started south on the 25th of the following month. On December 9, 1907, it was shot by natives near Fort Jameson, in Rhodesia, thus affording a proof that these birds cross the equator into southern latitudes while on their southward flight. Other birds have also been marked, and some of these have likewise been reported—one from Tunis. It is hoped that when the fact of these experiments becomes more widely known, more of the birds may be heard of, and the Director of the Vogelwarte makes an appeal to all who may become possessed of any marked birds to send them intact to the address given on the ring, deprecating at the same time any systematic war on the birds, with a view to obtaining marked specimens.

**The Eleventh International Geological Congress** is to be held at Stockholm in 1910. We have received from Prof. J. Gunnar Andersson, of Stockholm, the General Secretary to the Congress, a preliminary circular relating to the proposed

arrangements. It is considered desirable that preference should be given in the programme to the discussion of such questions as can receive new light from the geological phenomena of Sweden or the Polar Regions. A number of excursions are planned in connection with the meeting, the longer ones being arranged to precede or follow it, while several one-day excursions will take place during the meeting. The first excursions will be those to northern Sweden and Spitzbergen, which will begin about July 25, the meeting itself taking place about August 18 to 26. The subsequent excursions will be to various parts of southern Sweden, and the last of these will finish about the middle of September.

**Honour to Mr. John Thomson.**—In recognition of his early exploration of the antiquities of Cambodia, the President of the French Republic has conferred on Mr. John Thomson the honour of "Officier de l'Ordre du Cambodge."

**German Colonial School.**—In a recent number (1908, No. 2) of *Deutsche Erde*, a magazine for the study of German life in every phase, there is an article on the colonial school in Witzenhausen, with a biographical sketch of Prof. Fabarius, the director, by way of introduction. The institution was founded for the purpose of training young Germans in the administration of colonies overseas, and there are courses in practical economy, forestry, agriculture, cattle-breeding, and viticulture. All these are regarded as parts of the task of Germanism in world politics.

**A London Monument to Captain Cook.**—It is somewhat strange that no adequate monument to the great navigator should at present exist in London, though in Sydney and other cities of Australia his services have been suitably commemorated. The subject has lately been brought to the notice of the public by a letter to the *Times* from Sir J. H. Carruthers, who urged that some effort should be made to remedy this state of things. His proposal has since been warmly taken up by a small number of distinguished naval officers well acquainted with the Pacific, who, while bearing personal witness to the value of Cook's work in that quarter of the globe, have made an appeal to the public to support the proposed action. It is not the fact that no memorial whatever is to be found in any part of London, for, as pointed out in the *Times*, a terra-cotta medallion was last year fixed by the London County Council to the front wall of 88, Mile End Road, Cook's residence for some years. Outside London, a limited number of monuments to the navigator exist, e.g. the column on the top of Easby moor, near his birthplace—the village of Marton in Cleveland; and one erected by Sir Hugh Palliser (under whose auspices Cook received his appointment in 1768) in the grounds of his residence in Buckinghamshire. A monument erected at Méréville, within a few years of Cook's death, by a French admirer, M. de la Borde, was figured in the *Journal*, vol. 9, p. 226.

**A New Travel Monthly.**—Apart from our own *Journal*, the periodical literature specifically devoted to travel and associated subjects in this country has hitherto been extremely scanty, and we therefore welcome the announcement of the prospective issue of a new publication of the kind, under the title *Travel and Exploration*, the first number of which is to appear at an early date. It will be published by the firm of Mr. H. F. Witherby, who is himself known as a traveller both in Asia and Africa. We understand that while the form of the magazine will be such as to appeal to the general public rather than to specialists, every effort will be made to ensure that the information supplied is thoroughly sound and trustworthy. Besides illustrated narratives of travel, it will contain notes on a variety of topics connected therewith, including practical hints on the subject of outfit and methods of travel in general, as well as items of current information on the progress of exploration. The magazine will do a useful work if it aids in diffusing geographical knowledge

among the general public; while it should, at the same time, supply bright and interesting matter to those who read for entertainment only. Picturesque description, even in the case of fairly well-known countries, will never entirely lose its freshness.

**Port of Manchester: Erratum.**—In the November *Journal*, p. 501, the last three lines on the page should come at the end of the preceding paragraph.

**Vicinity of Lake Te Anan: Errata.**—For “Te Anau” read “Te Anan” throughout, and in sketch-map; for “By Prof. R. Marshall” read “By Prof. P. Marshall,” and in sketch-map; p. 354, l. 22, for “Manipouri” read “Manapouri,” for “Poteritari” read “Poteriteri”; l. 37, for “Darvan” read “Darran”; p. 356, l. 4, for “Dumed” read “Dunedin”; l. 3 from bottom, for “plots” read “flats”; p. 357, l. 5, for “from” read “in”; p. 358, l. 1, for “Melbourne” read “Sydney”; l. 7, for “height” read “vertical height”; l. 15, for “Cleddan” read “Cleddau”; l. 20, for “Grove” read “Grave”; l. 33, for “is” read “are”; p. 360, l. 5, delete “after”; l. 6, for “spring bring” read “spring often bring”; l. 8, for “hedges” read “ledges”; ll. 33, 34, for “*Notogogus menziesia*” read “*Nothofagus menziesii*,” for “*Plagianthus lyalli*” read “*Gaya lyalli*”; l. 7 from bottom, for “*Celinisias*” read “*Celmistias*”; p. 362, l. 2, for “dip” read “gap”; l. 3, for “over the” read “over to the”; l. 4, for “dip” read “gap”; l. 6, for “Grove” read “Grave”; l. 17, for “space” read “spurs”; p. 363, l. 4 from bottom, for “developed” read “eroded.”

## OBITUARY.

### Archibald Little.

It is with great regret that we record the death, which occurred at Falmouth on November 5, of Mr. Archibald Little, well known for his travels and commercial enterprise in Central and Western China. The son of a medical practitioner, Mr. Little was born in London in 1838, and was educated at St. Paul's School, and subsequently in Berlin. Going out to China many years ago, he settled in Sechuan, founding the Chung-king Trading Company, and doing much to open up commercial intercourse with the region of the Upper Yang-tse. The achievement which especially drew public attention to his work in China was his success in passing the rapids of the Yang-tse gorges with his little steamer the *Pioneer*, though the difficulties of the passage made it impossible to utilize this section of the river for a regular service of steam transport. Mr. Little's many journeys took him into some little-visited districts in the extreme west of China, and his experiences on several of these were described in his interesting volume, 'Mount Omi and Beyond,' which showed him to be possessed of no mean powers of observation. On these journeys he was accompanied by Mrs. Little, who is herself well known as the author of various books on Chinese life and characteristics, and who has initiated various movements of social reform in China—in particular, that in opposition to the practice of foot-binding among the women. Mr. Little was also the author of a useful volume on 'The Far East,' in the 'Regions of the World' Series, practically the only modern text-book in English on the geography of China and neighbouring regions. He had been a Fellow of our Society since 1866.

**Dr. S. W. Bushell.**

Dr. S. W. Bushell, whose death occurred in September at his residence at Harrow-on-the-Hill, was well known to the learned world as the writer of a variety of books and papers on subjects connected with China and the Far East, especially those bearing on art and antiquities. A son of Mr. William Bushell, of Ash-next-Sandwich, Kent, he was born in 1844, and educated for the medical profession. After a short tenure of appointments at Guy's Hospital and the Bethlem Royal Hospital, he went to China in 1868 as physician to the British Legation at Peking, and retained the appointment for thirty-one years. Besides being a Fellow of our Society, he had served on the councils of the Royal Asiatic and Numismatic Societies, and was a corresponding member of the Zoological Society. Besides numerous papers in learned societies' transactions, he was the author of a work on 'Oriental Ceramic Art,' published in 1899. Of a singularly retiring disposition, he had never come much before the public at large; but to those behind the scenes he was known as a man of sterling worth and sound learning. He was made a C.M.G. in 1897, and retired on a pension in 1899.

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**A. J. Mounteney Jephson.**

The last survivor among the European members of the Emin Pasha Relief Expedition has passed away in the person of Mr. A. J. Mounteney Jephson, who died at Ascot from heart-failure on October 22 last. The deceased was the youngest son of the Rev. John Mounteney Jephson, and was educated at Tonbridge preparatory school and at Eton. Besides serving under Stanley he had for a time held a lieutenant's commission in the Royal Irish Rifles. During the Emin Pasha Relief Expedition he was one of the leader's most trusted coadjutors, and was sent in advance of the main expedition to open up communication with Emin. It was while engaged on this mission that he shared the Pasha's experience in being made a prisoner by the latter's revolted Sudanese soldiers; but the two white men eventually escaped and joined the relief expedition. After his return Jephson told the story of these occurrences in his book entitled 'Emin Pasha and the Rebellion at the Equator,' and two years later he published another work under the title 'Stories told in an African Forest by Grown-up Children.' In 1895 he was appointed a Queen's messenger, and was reappointed after the King's accession. Like Stanley's other officers, he was in 1890 presented by the Royal Geographical Society with a bronze copy of the special gold medal given to his leader; and he was also a medallist of the Brussels Geographical Society.

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**Dr. Wilhelm Reiss.**

One of the most fruitful in results of the co-partnerships between scientific travellers, to which geography has owed so much, was that of Drs. Reiss and Stübel, whose joint labours in the volcanic region of the Andes of Ecuador have long been classical. Dr. Stübel's regretted death in 1904 has now been followed by that of his colleague, Dr. Reiss, to whom, though slightly the junior of the two, the inception of the scheme for research in the Cordillera was originally due. His death was the result of an accident while shooting in his park at Schloss Könitz, in Thuringia. Reiss was born at Mannheim in 1838, and showed an early bent towards science, which he studied at Heidelberg, paying special attention to geology. He made a number of journeys of research in Southern Europe and the islands of the Eastern Atlantic, where his interest became quickly directed

to volcanic problems. Having qualified as a teacher of geology at Heidelberg, he soon undertook further research journeys, in company with Stübel and Karl von Fritsch, with whom, in 1866, he visited Santorin immediately after the great eruption. Having developed his scheme for a thorough exploration of the volcanic region of the Andes, and secured the co-operation of Stübel, he set out thither in 1868, and the two friends spent nine years—working sometimes together, sometimes separately—in the investigation of the ranges of Colombia, Ecuador, Peru, and Bolivia, Reiss undertaking, in addition to geological studies, the astronomical and geodetic work necessary to supply a basis for the map. After their return to Europe the travellers undertook the preparation for publication, on a large scale, of the abundant material secured; but though many memoirs have since been published, the work has unfortunately been left still incomplete. Reiss was intimately connected with the Berlin Geographical Society, over whose meetings he presided in the years 1885 to 1887 and again in 1891. He continued throughout to take an eager interest in the progress of volcanic research, as well as in questions of a wider scope.

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### Rudolf Credner.

We regret to have to record the death of Prof. Rudolf Credner, of Greifswald University, in the fifty-eighth year of his age. Of robust giant frame and genial temperament, his health yet never properly rallied from the severe attack of 1904. The following particulars are taken from a biographical notice in *Geographischer Anzeiger* (vol. 9, No. 8): Of the thirty years devoted by him to the teaching of geography, twenty-seven were passed in Greifswald; first as extraordinary, and since 1891 as ordinary, professor. If Pomerania is now, more or less, alive to the interest of geography, the credit is due in the first place to Credner. To his initiative was due the founding, in 1882, of the "Geographische Gesellschaft in Greifswald," and he continued its president for a quarter of a century. In a score of excursions he elucidated the geography of the Baltic lands, drawing members even out of middle Germany to learn under his leadership the fascinating science of land and people. To his pen we owe numerous essays and treatises on the geography of Pomerania and Rügen; to his impulse, many more. His photographically illustrated lectures, clear in method and pithy in expression, backed by excursions in all weathers into the surrounding lands, and immediate interchange of question and answer with nature, exercised an inspiring influence on his hearers. In his students especially he kindled an abiding love and enthusiasm for the science. To him and his school we owe in part our present knowledge of those peculiar oscillations which the southern shores of the Baltic have undergone since the great glaciation, as well as the exact investigation into the conditions of the original ice-stream and the diluvial deposits of outer Pomerania.

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### CORRESPONDENCE.

#### The Bhot Kol Glacier, Nun Kun Mountains.

In the *Geographical Journal* for January, 1908, there is the account of a lecture by Dr. Hunter Workman on Nun Kun mountain. In it he refers to my previous exploration, and with regard to the extensive glacier on the west Dr. Workman asserts that I am wrong in stating that the glacier goes to join the Bhot Kol glacier, and he also says that the topography of Major the Hon. C. G. Bruce is confused.

Dr. Workman's map depicts the glacier as turning south to the Zoj Nai valley, and he even ventures to alter the position of such triangulated peaks as D 42.

I wrote to Major Bruce, who informs me that he ascended from Tongul, crossed the Sentik pass, and, then turning west, descended the Barmal glacier (of which he was the discoverer) and joined the Bhot Kol glacier. I informed Dr. Workman of this, and as he refused credence I asked two friends to visit the glacier. Accordingly, in August the Rev. M. E. Wigram crossed the Bhot Kol from Suru, and on the following day with one or two natives he ascended the somewhat steep icefall of the Barma glacier and found himself on the great upper glacier almost level, at a height of about 14,000 feet, with the Dome peak of Nun Kun, in full view at the head of the glacier 10 or 12 miles off. Mr. Wigram had my small map (published in the *Alpine Journal*) with him, and considered it correct.

A. NEVE.

### Asiatic Travels.

The reviewer, in the November *Journal*, of 'Selections from Travels and Journals in the Bombay Secretariat,' writes: "As to whether these papers had been published before, the editor gives little definite information in his Introduction." A critic, desirous of removing the possibility of a grave misapprehension, would have quoted the first words of the Preface: "The documents in this volume were brought together by me when I was Director of Records, Bombay Government. They have been buried in the archives of that Government or in old journals not easily accessible. To bring them to light and to preserve them 'from the greedy and devouring jaws of oblivion' is the object of this work."

The reviewer writes: "One of the more voluminous papers is a series of letters by C. Masson, the American Orientalist, who travelled in Afghanistan some seventy years ago. We have made a cursory examination of these letters side by side with Masson's well-known work, and the letters in Mr. Forrest's book appear to be identical in many respects, but there are improvements in the choice of phrases, descriptions, and so on, in Masson's book which leads one to think that the manuscript now reprinted may have been a sort of rough draft of the published work." The MS. was most certainly not a rough draft of the published work. If the critic had not made merely "a cursory examination" of the book he reviewed, he would have discovered that the papers were given to the Resident in the Persian gulf by Masson. The Resident forwarded them to the Bombay Government. In 1842, twelve years after he had given the papers to the Resident, Masson published his 'Narrative of Various Journeys In Balochistan, Afghanistan And the Panjab Including A Residence In those Countries From 1826-1838.' In chap. i. p. 2, vol. ii., Masson writes: "I there [Bushir] drew up from materials in my possession, and from Recollections, a series of papers relating to my journeys, and the Countries through which I had passed, which was forwarded to the Government of Bombay, or to Sir John Malcolm, then the Governor. I was not aware that such use would be made of them, nor am I quite sure I should have wished it; and I doubt whether it has not proved more hurtful than beneficial to me. I may justly lament that these documents should have been artfully brought forward in support of unsound views and ambitious projects. I may also be dissatisfied in a less degree, that the information they contained has served the purposes of men wanting the generosity to acknowledge it." On September 11, 1833, Mr. D. Wilson, the Resident in the Persian gulf, wrote: "I beg to observe that the papers now forwarded were given to me by Mr. Masson with no injunctions or understanding of concealment; he is perfectly aware that I would not hesitate

to communicate their contents to any of my friends. . . . I did not think it necessary to state directly to Mr. Masson that I should send copies of these papers, some of which were drawn up at my suggestion, and avowedly to be communicated to some distinguished individuals for the information of the Government, although he must have been aware that a public officer, situated as he knew me to be and making the enquiries I did, must have done so with a view to the good of the service" ('Selections from the Travels and Journals,' p. 106).

The reviewer writes: "Some of the names have been seriously mutilated. The village of Morad Ali is printed as Morally, and the well-known place Kohat appears throughout as Kivort." As Masson wrote from recollections, he may have put Morally for Morad Ali, or it may have been a local corruption. I do not think that even an Indian printer would, in three successive pages, convert Kohat into Kivort. As the reviewer is certain that Kivort is a misprint for Kohat, I presume he has been to Kohat and inquired whether the old name was different. In this connection, the critic, if he had read the volume with care, would have drawn attention to the important fact that Masson writes, "Khelat, when mentioned by a native, is usually styled the Kalort of Nasseer Khán." Masson also writes, "whose capital is Kalort" and "stationed at Kalort." In the 'Narrative of Various Journeys,' parts of the papers sent to Bombay were incorporated and the spelling of the places carefully revised. No alteration was, however, made in the text of the journals, for the reason given in the Preface: "Many words occur which are not easily accounted for, many names are spelt contrary to orthodox rules, many sentences war against the laws of grammar. It has been suggested that the text should be edited and the geographical information brought down to the present time. To alter the text would, however, destroy the old flavour of these travels and their main charm. It was proposed to give a list of errata, but after much labour it was abandoned as an impossible task. No two experts agreed as to what the list should contain."

"There are improvements in the choice of phrases, descriptions, and so on, in Masson's book." Masson's book was constructed with great literary skill, but if the reviewer, instead of making "a cursory examination of these letters," had read them with care and collated them with the Narrative, he would have discovered that the Journals are of far greater importance to the student of geography.

G. W. FORREST.

Iffley, Oxon., November 16, 1908.

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## MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1908-1909.

*First Meeting, November 2, 1908.*—Major LEONARD DARWIN, President, in the Chair.

The PRESIDENT said: This is the first of our evening meetings of the Session 1908-1909, and I cannot help thinking that those who have had the programme for the coming session, and who have looked through it, will agree that we have every prospect of having a session with somewhat exceptionally interesting meetings. With such a list of speakers it is rather invidious to pick out special names, but I am sure that we are all glad that we shall have the opportunity of hearing Dr. Sven Hedin on his wonderful travels in Asia. The date is not definitely arranged, but will probably be February 8. We also shall have Dr. Stein, who has done such admirable work in Central Asia.

Though I cannot discuss the geographical events that have occurred since our last meeting, I may perhaps just mention that there has recently been a Geographical Society founded at Leeds. We always keep in touch as far as we can with these local Geographical Societies, and we are delighted when a new one is founded. We also have to thank our late President, Sir Clements Markham, for presiding at the opening meeting of that Society, and making it, I believe, a thorough success.

The paper read was :—

“Unknown Western Asia.” By D. G. Hogarth.

*Second Meeting, November 16, 1908.*—Major LEONARD DARWIN, President, in the Chair.

ELECTIONS :—*Herbert Thomas Allen; Wolfgang F. Asimont; Robert J. T. Barnes; Augustus Barracough; Captain F. Bigg-Wither; H. J. Bond; Frank Bowker; Kelsall Bradley; William Anthony Brown; W. Campbell Brown, M.A.; Lieut. John Burn, R.N.R.; R. F. L. Burton; Viscount Bury; Major R. L. Carnegie (9th Ghoorka Rifles); Captain J. Chancellor, D.S.O., R.E.; Lieut. Gordon Humphry Chapman, I.A.; Captain G. F. Clayton, R.A.; Norberto B. Cobós; Rev. George Samuel Cockin, M.A.; Alexander Colledge; Walter Arnold Conduitt; John Ashley Cooper; Lieut. Fredk. George Cooper, R.N.R.; Henry Copping; Robert Firth Crosland; Harold Robert Cross; William Henry Crosthwaite; Edward R. Davson; Major H. Delmé-Radcliffe (Royal Welsh Fusiliers); Captain E. S. Dicken (Queen's Bays); Henry Dicks; John Hy. Stephen Dimmer; John Eaglesome, C.M.G.; George Washington Ellis; Ernest Favenc; Chas. Willington Furlong; T. P. Gilfedder; Rev. Wm. Glover; Lieut. J. F. S. Gordon (Lothian Regt.); Ralph Brampton Harley; Engineer-Lieut. Walter Scott Hill, R.N.; Walter J. Hill; Rev. F. A. Hirst; John E. Hodgson; William J. Hodgson; Captain J. Johnstone (King's Royal Rifle Corps); Arnold Egerton Jones; Charles Henry Kesteven; Philip Lake, M.A.; George Lamley; Hon. Francis Augustus Larmour; Captain John A. Legge; Stephen J. Lett; Captain H. F. E. Lewin, R.A.; Godfrey Charles Lomer; Edward Rogers Long; Ronald Macdonald; Donald Mackay; Captain E. E. B. Mackintosh, R.E.; Arthur B. Malden; William J. Maule; J. M. Moubray; Robert P. Page; Henry Palmer; Richard W. Parker; Sandon Perkins; John A. Pilling; Robert Alexr. Reddie (16th Lancers); Preb. Bernard Reynolds, M.A.; Alceste C. Rigo de Righi; Geoffrey E. Ryle; Captain P. H. Short (Gloucester Regt.); Captain Allen R. B. Shuttleworth, I.A.; Eric Smith; E. S. R. Smith; Fras. B. Stead; Alfred P. Stokes; Francis W. Stronge; Arthur G. Tansley; Henry B. Tate; John A. Tregelles; Sutton Timmis; Captain A. K. Utterson (Dorset Regt.); Frank B. Vrooman; Frank F. P. Walsh; Lionel E. Warren, R.F.A.; Captain W. T. Wyndowe (58th Regt.).*

The paper read was :—

“Some Aspects of the River Paraná and its Basin: an Economic Survey.” By W. S. Barclay.

## GEOGRAPHICAL LITERATURE OF THE MONTH.

*Additions to the Library.*

By EDWARD HEAWOOD, M.A., Librarian, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are as a rule written in full:—

A. = Academy, Academie, Akademie.  
 Abb. = Abhandlungen.  
 Ann. = Annals, Annales, Anraalen.  
 B. = Bulletin, Bollettino, Boletim.  
 Col. = Colonies.  
 Com. = Commerce.  
 C.R. = Comptes Rendus.  
 E. = Erdkunde.  
 G. = Geography, Géographie, Geografia.  
 Ges. = Gesellschaft.  
 I. = Institute, Institution.  
 Iz. = Izvestiya.  
 J. = Journal.  
 Jb. = Jahrbuch.  
 k.k. = kaiserlich und königlich.  
 M. = Mitteilungen.

Mag. = Magazine.  
 Mem. (Mém.) = Memoirs, Mémoires.  
 Met. (mét.) = Meteorological.  
 P. = Proceedings.  
 R. = Royal.  
 Rev. (Riv.) = Review, Revue, Rivista.  
 S. = Society, Société, Selakab.  
 Sc. = Science(s).  
 Sitzb. = Sitzungsbericht.  
 T. = Transactions.  
 Ts. = Tijdschrift, Tidsskrift.  
 V. = Verein.  
 Verh. = Verhandlungen.  
 W. = Wissenschaft, and compounds.  
 Z. = Zeitschrift.  
 Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

## EUROPE.

- Alps.** Larden.  
 Guide to the walks and climbs around Arolla. Collected and written by Walter Larden. London: S. Chick & Co., [1908]. Size 5½ × 4, pp. x. and 138. *Illustrations.* Price 2s. 9d. Presented by Dr. Brushfield.  
 Copies are to be obtained at the hotels at Arolla, or from Dr. Brushfield, St. Mary's, Scilly Isles.
- Austria—Bosnia and Herzegovina.** *Alpine J.* 24 (1908): 209–218. Freshfield.  
 Through the Dinaric Alps. By Douglas W. Freshfield. *Illustrations.*
- Austria—Karst.** *Globus* 94 (1908): 53–56. Mühlhofer.  
 Der Lindner-Timavo und seine Bedeutung für das Studium der Karsthydrographie. Von Leutnant F. Mühlhofer. *Plans.*
- Azores—Volcanoes.** *Appalachia* 11 (1908): 344–350. Pickering.  
 The Volcanoes of the Azores. By Prof. William H. Pickering. *Illustrations.*
- Central Europe—Waterways.** *B.S.G. l'Est* 29 (1908): 5–9. Auerbach.  
 Moselle, Sarre, Chiers. Projets de canalisation et de jonction. Par B. Auerbach.
- Europe.** Trevor.  
 En route: a descriptive automobile tour through nine countries and over nineteen great passes of Europe. By Roy Trevor. London: Stanford, 1908. Size 9 × 6, pp. xvi. and 304. *Sketch-maps and Illustrations.* Price 10s. 6d. net. Presented by the Publisher.
- France—Forestry.** *La G., B.G.S. Paris* 17 (1908): 439–452. Clouzot.  
 Anciennes forêts de la France. Par Étienne Clouzot. *Sketch-maps.*
- Germany—Anthropogeography.** *Deutsche Erde* 7 (1908): 14–22, 45–52. Pessler.  
 Die Haustypengebiete im Deutschen Reiche. Eine ethno-geographische Untersuchung. Von Dr. Willi Pessler. *Map and Illustrations.* [See ante, p. 618.]

**Germany—Meteorology.****Lüdeling.**

Veröffentlichungen des K. Preuss. Meteorologischen Instituts, Nr. 197. Ergebnisse der Niederschlags-Beobachtungen im Jahre 1905. Von G. Lüdeling. Berlin, 1908. Size 13 x 10, pp. xxxiv. and 162. *Map.*

**Holland—Place-names.**

Nomina Geographica Neerlandica. Geschiedkundig Onderzoek der Nederlandsche aardrijkskundig namen . . . uitgegeven door het Kon. Nederlandsch Aardrijkskundig Genootschap. V<sup>o</sup> Deel. Leyden: E. J. Brill, 1901. Size 9½ x 6, pp. viii. and 168. *Presented by the Kon. Nederlandsche Aardrijkskundig Genootschap.*

This part deals with the names of the province of Drenthe.

**Iceland—Archæology.****Jonsson and Bruun.**

*Oversigt K. Danske Vidensk. S. Forhandl.*, 1908: 73-111.

Det gamle Handelssted Gásar (at Gásun), yngre Gaesir, ved Øfjörd (Eyjafjörður). Undersøgelsor foretagne i Sommeren 1907. Af Finnur Jonsson og D. Bruun. *Plans and Illustrations.*

**Italy—Emilia.***Riv. G. Italiana* 15 (1908): 265-280.**Govi.**

Di alcune salse delle provincie di Modena e Reggio. Appunti di Silvio Govi. *Sketch-maps and Illustration.*

**Italy—Praeneste.****Magoffin.**

*Johns Hopkins University Studies* 26 (1908): Nos. 9-10, pp. 102.

A study of the topography and municipal history of Praeneste. By Ralph van Deman Magoffin. *Illustrations.*

**North Sea.***J.R. United Service* 1. 52 (1908): 3-27.**Campbell.**

The strategical position in the North Sea as strengthened by the Forth and Clyde Battle-ship Canal and the "Dover and Sangatte" tube railway. By Vice-Admiral Sir Charles Campbell. *Map and Section.*

**Russia—Finland.****Waineman.**

A summer tour in Finland. By Paul Waineman. London: Methuen & Co., [1908]. Size 9 x 5½, pp. xvi. and 318. *Sketch-map and Illustrations.* Price 10s. 6d. *net.* *Presented by the Publishers.*

**Russian Empire—Population.** *Petermanns M.* 54 (1908): 141-145.**Woeikow.**

Resultate des russischen Zensus und Zentrum der Bevölkerung Russlands. Von A. Woeikow.

**Spain—Geographical Bureau.** *Rev. G. Col. y Mercantil* 5 (1908): 213-216.

El Gabinete Geográfico del Ministerio de Estado.

Notes on the history of this bureau.

**Switzerland—Hydrology.**

Tableau graphiques des Observations hydrométriques suisses et des températures de l'air et des hauteurs pluviales pour l'année 1906. Bern, 1907. Size 15 x 10, pp. 10; 45 *folding Diagrams.*

**United Kingdom—Geological Survey.**

Memoirs of the Geological Survey. Summary of Progress of the Geological Survey of the United Kingdom and Museum of Practical Geology for 1907. London: E. Stanford, 1908. Size 9 x 6, pp. 176. *Sketch-maps, Illustrations, Sections, and Diagram.* Price 1s.

**United Kingdom—Geology.***Geol. Mag.* 5 (1908): 337-341.**Bonney.**

On the evidence for desert conditions in the British Trias. By Prof. T. G. Bonney.

**United Kingdom—Magnetism.****Chree.**

Magnetic declination at Kew Observatory, 1890 to 1900. By Dr. C. Chree. (From the *Philosophical Transactions of the Royal Society of London*, Series A, vol. 208.) London, 1908. Size 12 x 9, pp. 205-246. *Diagrams.* Price 2s.

**United Kingdom—Scotland.** *Scottish G. Mag.* 24 (1908): 365-369.**Mart.**

The River Massan. By Frederick Mart. *Sketch-map and Diagram.*

The Massan enters the Echaig below its exit from Loch Eek.

## ASIA.

## Arabia.

Lammens.

*Mélanges Faculté Orient., Université de St. Joseph, Beyrouth* 2 (1907): 397-407.  
Maronites, Mazonitai, et Mazoun du 'Oman. Par le P. Henri Lammens.

## Asia.

Reynolds.

*Regional Geography: Asia.* By [Miss] J. B. Reynolds. London: A. & C. Black, 1908. Size  $8\frac{1}{2} \times 5\frac{1}{2}$ , pp. 128. *Maps and Illustrations.* Price 2s. Presented by the Author.

## Asia—Political.

*Asiatic Quarterly Rev.* 25 (1908): 307-328.

Lynch.

The Anglo-Russian convention. By H. F. B. Lynch.

## Central Asia.

*La G., B.S.G. Paris* 17 (1908): 425-430.

Pellicot.

Notre mission in Asie centrale. Par Paul Pelliot.

## Central Asia—Anthropology.

*J.G.* 6 (1908): 313-328.

Huntington.

Khirghiz nomads and the influence of the high plateaus. (Reprinted from 'The Pulse of Asia,' by Ellsworth Huntington.)

## China.

*La G., B.S.G. Paris* 17 (1908): 431-438.

D'Ollone.

De Yun-nan-sen à Tch'eng-tou (Mission d'Ollone). Par Capitaine H. d'Ollone. *Sketch-map.*

See note in the August number, p. 183.

## China—Bibliography.

Cordier.

*Bibliotheca Sinica. Dictionnaire bibliographique des ouvrages relatifs à l'Empire Chinois.* Par Henri Cordier. Deuxième édition. Vol. 4. Paris: E. Guilmoto, 1907-8. Size  $11 \times 7\frac{1}{2}$ , pp. 2384-3252. Price 45s.

## India.

The Imperial Gazetteer of India. New edition. Vols. 15-18. Karāchi to Nyāgarh. Oxford: Clarendon Press, 1908. Size  $9 \times 5\frac{1}{2}$ . *Maps and Plans.* Presented by the India Office.

## India—Burma.

*Records Geol. Survey India* 36 (1908): 149-155.

Cotter.

The structure and age of the Taungtha Hills, Myingyan district, Upper Burma. By G. de P. Cotter. *Map and Illustration.*

## India—Calcutta.

*Records Geol. Survey India* 36 (1908): 214-232.

Middlemiss.

Two Calcutta Earthquakes of 1906. C. S. Middlemiss. *Map.*

## India—Goa.

Brion.

Sociedade de Geographia de Lisboa. A India Portuguesa. Por Hypacio de Brion. Lisbon, 1908. Size  $9 \times 6$ , pp. 30. *Illustrations.*

## India—Kashmir.

*Alpine J.* 24 (1908): 195-209.

Mumm.

In and about Kashmir. By A. L. Mumm. *Illustrations.*

## Japan—Sakhalin.

Jimbō.

Preliminary notes on the geology of Japanese Sakhalin. By Kotora Jimbō. (From *Transactions of the Sapporo Natural History Society*, vol. 2, parts 1 and 2, 1907-8.) N.P., 1907-8. *Map.*

Noticed in the Monthly Record, ante, p. 620.

## Malay Archipelago—Java.

Klerck.

De Java-Oorlog van 1825-30. Door E. S. de Klerck. Uitgegeven door het Bataviaasch Genootschap van Kunsten en Wetenschappen. 5<sup>e</sup> Deel. Batavia, etc., 1908. Size  $10\frac{1}{2} \times 7$ , pp. xiv. and 758. *Map.*

## Persia.

*B.S.G. Lille* 50 (1908): 27-38.

Merchier.

Le plateau de l'Iran: son rôle dans la politique mondiale. Par A. Merchier. *Sketch-map.*

## Persia—Ormuz.

*B.S.G. Lisboa* 26 (1908): 151-153.

Jardim.

Uma inscripção portuguesa em Ormuz. Por Fernando Jardim.

## Turkey—Arabia.

Moritz.

*Mélanges Faculté Orientale, Université St. Joseph, Beyrouth* 3 (1908): 387-436.

Ausflüge in der Arabia Petraea. Von Dr. B. Moritz. *Illustrations.*

Describes and figures various ruins.

**Turkey—Palestine—Bibliography.****Thomsen.**

Systematische Bibliographie der Palästina-Literatur auf Veranlassung des Deutschen Vereins zur Erforschung Palästinas bearbeitet von Peter Thomsen. I. Band, 1895-1904. Leipzig and New York: R. Haupt, 1908. Size 9½ × 6½, pp. xvi. and 204.

Vol. 1 of a periodical bibliography of Palestine.

**Turkey—Syria.****Lammens.**

*Mélanges Faculté Orient., Université de St. Joseph, Beyrouth* 2 (1907): 366-396.

Le massif du Gabal Sim'an et les Yézidis de Syrie. Par le P. Henri Lammens.

**Turkey—Syria.****Monterde.**

*Mélanges Faculté Orient., Université St. Joseph, Beyrouth* 2 (1907): 336-345.

La voie romaine d'Antioche à Ptolemais. Par le P. René Monterde.

**AFRICA.**

**Abyssinia.** *Deutsche Rundschau G.* 30 (1907-8): 362-368, 406-413. **Castro.**  
Eine Reise zum Berg Zuala, zum See Zuai und zu den Sodd. Von Dr. Lincoln de Castro. *Map.*

**Africa.** *Mouvement G.* 25 (1908): 289-294. **Adler and Wauters.**

Du Cap à Banana à travers l'Afrique australe. L'odyssée de M. Adler. Par A. J. W. *Sketch-map.*

The journey was made across South Africa to the mouth of the Zambezi, and thence by Nyasa, Tanganyika, and the Congo.

**British East Africa.** *B.S.G. Italiana* 9 (1908): 561-576, 636-652. **Faraggiani.**

Alcune notizie sui Suk e sui Turcana. Del tenente Alessandro Faraggiani. *Map and Illustrations.*

**Cape Verde Islands.** *B.S.G. Lisboa* 27 (1908): 65-81.

**Bascellos.**

O archipelago de Cabo Verde. Por Christiano de Senna Bascellos.

**Central Africa.****Wollaston.**

From Ruwenzori to the Congo: a Naturalist's journey across Africa. By A. F. R. Wollaston. London: J. Murray, 1908. Size 9 × 5½, pp. xxvi. and 316. *Map and Illustrations.* Price 15s. net. Presented by the Publisher. [See Review, ante.]

**Eritrea—Volcanoes.** *Riv. G. Italiana* 15 (1908): 257-264. **Dainelli and Marinelli.**

A proposito di moderne manifestazioni di attività vulcanica in Dancalia. Osservazioni di G. Dainelli ed O. Marinelli.

**French Congo—Geology.****Gentil and Lemoine.**

*Renseignements Col., Afrique française* 18 (1908): 98-100.

Observations sur la géologie des pays entre l'Oubangui et le Chari, d'après les échantillons rapportés par M. G. Bruehl. Par Louis Gentil et Paul Lemoine. *Sketch-maps and Illustrations.*

**Gold Coast.** *J. African S.* 7 (1908): 344-373.

**Watherston.**

The Northern Territories of the Gold Coast. By Lieut.-Col. A. E. G. Watherston.

**Portuguese West Africa—Ethnography.****Bastos.**

*B.S.G. Lisboa* 26 (1908): 5-15, 44-56, 81-99, 135-140, 154-176, 197-207.

Traços geraes sobre a ethnographia do districto de Benguela. Por Augusto Bastos.

**Portuguese West Africa—Petroleum.****Costa.**

Sociedade de Geographia de Lisboa. A riqueza petrolifera d'Angola. Por João Carlos da Costa. Lisboa, 1908. Size 9 × 6, pp. 16.

**Portuguese West Africa—São Thomé.** *B.S.G. Lisboa* 27 (1908): 113-134.

**Campos.**

S. Thomé. Par Ezequiel de Campos.

**Sahara.** *Renseignements Col., Afrique française* 18 (1908): 76-84, 102-109. **Dinaux.**

Une mission dans l'Adrar du Niger: 8 mars—25 juillet 1907. Rapport de tournée du Capitaine Dinaux. *Map and Illustrations.*

**Seychelles.**

*B. Imperial I.* 6 (1908): 107-126.

The Development of the Resources of the Seychelles.

- South Africa—Structure.** *Petermanns M.* 54 (1908): 140-141. **Passarge.**  
 Die Tektonik der südafrikanischen Küsten. Von S. Passarge.  
**West Africa—Boundary.** *B. Comité Afrique française* 18 (1908): 163-170. **Terrier.**  
 La délimitation franco-allemande du Cameroun. Par Auguste Terrier. *Map.*

## NORTH AMERICA.

- Alaska—Boundary.** *P. American Philosophical S.* 47 (1908): 86-90. **Tittmann.**  
 Progress of the demarcation of the Alaska boundary. By B. H. Tittmann. *Also separate copy, presented.*  
 Noticed in the Monthly Record, November, p. 532.
- Bermudas—Magnetism.** *Terrestrial Magnetism* 13 (1908): 49-56. **Cole.**  
 Magnetic declination and latitude observations in the Bermudas. By J. F. Cole. *Chart.*
- Canada.**  
 Department of the Interior. Report of the Chief Astronomer . . . for the year ending June 30, 1906. Ottawa, 1907. Size 10 × 6½, pp. 136. *Illustrations and Diagrams.*  
 The report contains an appendix dealing with the demarcation of the Alaska boundary (see November number, p. 532). Another by Dr. R. A. Daly describes geological researches along the 49th meridian.
- Canada.** *Petermanns M.* 54 (1908): 123-137. **Haas.**  
 Zur Geographic und Geologie Canadas und des arktischen Archipels von Nordamerika. Von Prof. Dr. Hippolyt Haas. *Map.*  
 Largely a summary of recent researches carried out by the Geological Survey of Canada in the region of Hudson bay and the northern archipelago.
- Canada—Bay of Fundy.**  
 Tables of hourly direction and velocity of the currents, and time of slack water, in the Bay of Fundy and its approaches. Published by the Department of Marine and Fisheries, Canada. Ottawa, 1908. Size 10 × 6½, pp. 16. *Chart.*
- Canada—British Columbia.** *B. American G.S.* 40 (1908): 340-344. **Lahee.**  
 An Alluvial Fan, near Field, in British Columbia. By Fred. H. Lahee. *Contour-map, Section, and Illustration.*  
 Describes a double alluvial fan, which is slowly filling up the Emerald lake.
- Canada—Geological Survey.** **Nicolas.**  
 Geological Survey of Canada. General Index to Reports, 1885-1906. Compiled by F. J. Nicolas. Ottawa, 1908. Size 10 × 6½, pp. xii. and 1014.
- Canada—Geological Survey.**  
 Summary report of the Geological Survey Department of Canada for the calendar year 1906. Ottawa, 1906. Size 9½ × 6½, pp. 206.
- Panama—Mosquitos.** *Smithsonian Misc. Coll.* 52 (No. 1792) (1908): 49-77. **Busck.**  
 Report on a trip for the purpose of studying the Mosquito Fauna of Panama. By August Busck.
- United States.**  
 Twenty-eighth Annual Report of the Director of the United States Geological Survey to the Secretary of the Interior for the fiscal year ended June 30, 1907. Washington, 1907. Size 9 × 6, pp. iv. and 80. *Map. Presented by the U.S. Geological Survey.*
- United States—California.** **Patterson and Ellermann.**  
*National G. Mag.* 19 (1908): 457-468.  
 The magic mountain. By J. N. Patterson. *Illustrations.*  
 Mount Wilson, the home of the Solar observatory of the Carnegie Institute. The striking photographs are by Prof. F. Ellerman.
- United States—Coronado's March.** *B. American G.S.* 40 (1908): 257-276. **Potter.**  
 Chichilticalli. By Samuel O. L. Potter. *Sketch-map.*  
 Discusses the location of this place on Coronado's route.

- United States—Forests.** *J. Franklin I.* 165 (1908): 345-361. **Will.**  
 Saving the forests and streams of the United States. By Dr. Thomas E. Will.  
*Illustrations.*  
 In support of proposed Government action.
- United States—Heights.** *B. American G.S.* 40 (1908): 332-340. **Darton.**  
 The Highest Points in States in the United States. By N. H. Darton. *Illustrations.*  
 Gives the altitudes as determined by the U.S. Geological Survey.
- United States—North Dakota.** *B. American G.S.* 40 (1908): 321-332, 401-415. **Craig.**  
 North Dakota life: Plant, Animal, and Human. By Wallace Craig. *Table.*
- United States—Pennsylvania.** *T. Connecticut A.* 13 (1907): 149-297. **Bishop.**  
 The state works of Pennsylvania. By Avard Longley Bishop. *Maps.*  
 The term "State works" here signifies canals and railways.
- United States—Relief.** *J.G.* 6 (1908): 305-312. **Mansfield.**  
 Glacial and normal erosion in Montana and Wisconsin. By G. R. Mansfield.  
*Illustrations.*
- United States—Trade.** *U.S. Census Bureau, B.* No. 91 (1908): pp. 58. ———  
 Transportation by water, 1906: United States.
- United States—Yellowstone Park.** *B. American G.S.* 40 (1908): 277-282. **Grant.**  
 Changes in the Yellowstone Park. By Dr. Roland Dwight Grant.  
 The writer considers that the changes which may be noted are no evidence that the subterranean forces are dying out.

## CENTRAL AND SOUTH AMERICA.

- Argentina—Chaco.** **McLean.**  
 Informe sobre exploración al Chaco. Por Juan McLean. (In 'Boletín del Ministerio de Agricultura,' Buenos Aires, Tomo 9, Núm. 5 y 6, Mayo y Junio de 1908.) Size 8½ × 5½, pp. 244-259. *Illustrations.*  
 The writer was in charge of an expedition for the examination of the country along the projected railway to Bolivia. The present report deals with the present condition of the Chaco and its native inhabitants.
- Argentina—Pilcomayo.** **Asp.**  
 Expedición al Pilcomayo, 27 de Marzo—6 de Octubre de 1903. Por Otto Asp. (República Argentina: Anales del Ministerio de Agricultura, Tomo 1, Núm. 1.) Buenos Ayres, 1905. Size 10½ × 7½, pp. 48. *Map.*
- Chile—Minerals.** **Yunge.**  
 Estadística Minera de Chile en 1904 i 1905. Por Guillermo Yunge. Tomo 2. Santiago, 1907. Size 10½ × 7, pp. x. and 456. *Illustrations and Sections.*  
 This volume seems complete in itself, as it opens with a general sketch of Chile.
- West Indies—Cotton.** ———  
 The British Cotton Growing Association. West Indian Cotton Growing Conference, August, 1908. Manchester, 1908. Size 8 × 5½, pp. 160. *Sketch-map.*
- West Indies—Cuba.** *National G. Mag.* 19 (1908): 485-498. **Wilcox.**  
 Among the mahogany forests of Cuba. By Walter D. Wilcox. *Sketch-map and Illustrations.*
- West Indies—St. Vincent.** **Flett.**  
 Petrographical notes on the products of the eruptions of May, 1902, at the Soufrière in St. Vincent. By Dr. John S. Flett. (From the *Philosophical Transactions of the Royal Society of London*, Series A, vol. 208.) London, 1908. Size 12 × 9, pp. 305-332. *Illustrations.* Price 2s. 6d. *Presented by the Royal Society.*
- West Indies—St. Vincent and Martinique.** **Anderson.**  
 Report on the eruptions of the Soufrière in St. Vincent in 1902, and on a visit to Montagne Pelée in Martinique. Part II. The changes in the districts and the subsequent history of the volcanoes. By Dr. Tempest Anderson. (From the *Philosophical Transactions of the Royal Society of London*, Series A, vol. 208.) London, 1908. Size 12 × 9, pp. 275-303. *Illustrations.* Price 7s. 6d. *Presented by the Royal Society.*

## AUSTRALASIA AND PACIFIC ISLANDS.

**New Guinea—Dutch.** *National G. Mag.* 19 (1908): 469-484. **Barbour.**  
Notes on a zoological collecting trip to Dutch New Guinea. By Thomas Barbour.  
*Illustrations.*

A visit to Geelvink bay and its islands.

**New Guinea—Dutch.** *Jahresber. G. Ges. Zürich* (1907-8): 71-106. **Hirschi.**  
Reisen in Nordwest Neu-Guinea. Von Dr. H. Hirschi. *Map and Illustrations.*

Account of a research expedition carried out in 1905 on behalf of a Dutch company to the region of McCluer gulf.

**New Zealand—Census.**

New Zealand, 1907. Results of the Census of the Colony of New Zealand, taken for the night of April 29, 1906. Wellington: John Mackay, 1907. Size 13 × 8½, pp. viii., 458, xlvii., and xxvi.

The total population appears as 948,649, including Maoris and the natives of the Cook and Chatham islands, etc. (about 60,000 in all).

**New Zealand—Southern Islands.** *Scottish G. Mag.* 24 (1908): 337-347. **Pillans.**  
Notes on the Sub-Antarctic islands. By W. S. Pillans. *Map and Plan.*

The writer went as a passenger on the government steamer on its last trip to these islands.

**Queensland—Great Barrier.**

**Hedley and Taylor.**

Coral Reefs of the Great Barrier, Queensland: a study of their structure, life-distribution, and relation to mainland physiography. By C. Hedley and T. Griffith Taylor. (Read at the Adelaide meeting of the Australasian Association for the Advancement of Science, held January, 1907.) Size 8½ × 5, pp. 18. *Sketch-maps, Diagrams, and Sections.*

See note in the Monthly Record, November, p. 533.

## POLAR REGIONS.

**Arctic Exploration.**

**Lindeman.**

Aus frühern und neuern Forschungsreisen in das Nordpolarmeer. Von Dr. Moritz Lindeman. (Sonder-Abdruck aus der Zeitschrift "Gaea," Heft 5, 1908.) Leipzig, 1908. Size 9½ × 6, pp. 18.

**Arctic Exploration.**

**Drygalski.**

Die neuesten Polarreisen und die nordwestliche Durchfahrt. Von Erich von Drygalski. (Sonder-Abdruck aus der Marine Rundschau, Berlin, Mai 1908.) Size 9 × 6½, pp. 10.

**Arctic Ocean.**

*Ann. G.* 17 (1908): 238-267.

**Blanc.**

L'expédition arctique russe de 1905. Par Edouard Blanc.

A note on this expedition was given in vol. 27, p. 196.

**South Orkneys.**

*Scottish G. Mag.* 24 (1908): 348-355.

**Mossman.**

The South Orkneys in 1907. By R. C. Mossman. *Illustrations.*

## PHYSICAL AND BIOLOGICAL GEOGRAPHY.

**Erosion.**

*R. Engineers J.* 7 (1908): 341-359.

**Pitt.**

Coast Erosion and its prevention. By Colonel W. Pitt.

Concerned chiefly with prevention from an engineering point of view.

**Geology.**

*American J. Sci.* 26 (1908): 17-50.

**Daly.**

The Mechanics of Igneous Intrusion. Third paper. By Reginald A. Daly.

**Geology.**

*Naturw. Wochenschrift* 23 (1908): 385-393, 401-405.

**Philippi.**

Ueber Intrusionen und tektonischen Störungen. Von Dr. E. Philippi. *Maps and Sections.*

**Geophysics.****Love.**

Note on the representation of the Earth's surface by means of spherical harmonics of the first three degrees. By A. E. H. Love. (From the *Proceedings of the Royal Society, A*, vol. 80.) [London, 1908.] Size 10 × 7, pp. 553-556. *Diagram*.

**Oceanography—Deposits.** *C.R.A. Sc. Paris* 148 (1908): 1184-1186.**Thoulet.**

De l'influence du vent dans le remplissage du lit de l'Océan. Note de [J.] Thoulet.

**Oceanography—Indian Ocean.**

Koninklijk Nederlandsch Meteorologisch Instituut, No. 104. Oceanographische en meteorologische waarnemingen in den Indischen Ocean, September, October, November (1856-1904). Utrecht, 1908. Size 13 × 10, pp. xiv. and 190. *Charts* (in separate atlas, size 14½ × 28).

This publication completes the series of observations for the year, former parts having dealt with the other three quarters.

**Phenology.****Abbe.**

U.S. Department of Agriculture, Weather Bureau, Bulletin No. 36. A first report on the relations between climates and crops. By Cleveland Abbe. Washington, 1905. Size 9 × 6, pp. 388.

**Soils.***Annuaire géol. Russie* 10 (1908): 63-75.**Glinka.**

Schematische Bodenkarte der Erde. Von K. D. Glinka. *Map*. [In Russian and German.]

**Terrestrial Magnetism.****Schuster.**

The diurnal variation of terrestrial magnetism. By Arthur Schuster. (From the *Philosophical Transactions of the Royal Society of London*, Series A, vol. 208.) London, 1908. Size 12 × 9, pp. 163-204. *Price* 2s.

**Terrestrial Magnetism.** *Terrestrial Magnetism* 13 (1908): 57-62.**Steiner.**

On Earth-currents and magnetic variations. By Dr. L. Steiner. *Diagrams*.

**ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.****Commercial—Textiles.****Garrett.**

Fibres for fabrics. By A. E. Garrett. London: Hodder & Stoughton, [1908]. Size 8 × 5, pp. xii. and 220. *Price* 2s. 6d. *net*. *Presented by the Author*.

**Ethnology.** *Atti S. Italiana Progresso Sc., Parma* 1907 (1908): 232-242.**Sergi.**

Di una classificazione razionale dei gruppi umani. Del Prof. G. Sergi.

**Historical.** *B.S. Mexicana G.* 2 (1907): 300-304, 305-318, 358-389.**Nuttall.**

Las primeras relaciones entre Mexico y el Japon. Por Zelia Nuttall.

**History of Cartography.** *Riv. G. Italiana* 15 (1908): 281-290.**Mori**

Una carta nautica sconosciuta di Vincenzo di Demetrio Volcio. *Appunti di Attilio Mori*.

This chart, which is of date 1592, includes as inset a large-scale representation of the Adriatic.

**BIOGRAPHY.****Las Casas.***Jahresber. G. Ges. Zürich*, 1907-8: 25-69.**Stoll.**

Der Bischof Bartolomé de las Casas, ein Zeitgenosse des Columbus, seine wissenschaftlichen und humanitären Verdienste. Von Prof. Dr. Otto Stoll.

**GENERAL.****Bibliography.****Baschin.**

Bibliotheca geographica. Jahresbibliographie der geographischen Literatur. Herausgegeben von der Gesellschaft für Erdkunde zu Berlin. Bearbeitet von Otto Baschin. Band xiii., Jahrgang 1904. Berlin: W. H. Kühl, 1908. Size 9 × 6, pp. xvi. and 560.

- Education.** *G. Teacher* 4 (1908): 209-221. **Gregory.**  
 Scientific method in the teaching of geography. By Prof. R. A. Gregory.
- Education.** *G. Teacher* 4 (1908): 221-229. **Smith.**  
 Physical geography as an essential part of school geography. By T. Alford Smith.
- French Colonies—Cartography.** **Almeida.**  
*Congrès Col., Bordeaux* 1907 (1908): 518-522.  
 La cartographie des colonies françaises. Par Camena d'Almeida.
- French Colonies—Congress.**  
 Ministère des Colonies. Congrès Colonial de Bordeaux (4-8 Août 1907): Rap-  
 ports: Communications: Vœux. Bordeaux: Institut Colonial, 1908. Size 10  
 × 6½, pp. 742. *Illustrations.*
- Geographical Methods.** *B.R.S.G. Madrid* 50 (1908): 110-186. **Ballester y Castell.**  
 Investigaciones sobre metodología geográfica. Por Rafael Ballester y Castell.
- Geographical Research.** **Dalla Vedova.**  
*Atti S. Italiana Progresso Sc., Parma* 1907 (1908): 174-182.  
 Sull' oggetto e sugli uffici della Sezione VI. dell'Associazione italiana per il pro-  
 gresso delle scienze. Del Dr. G. Dalla Vedova. *Also separate copy.* (Size 10½  
 × 7.)
- Geography—Text-book.** **Mejia.**  
 Geografía universal segun el procedimiento ciclico. Por Martin Restrepo Mejia.  
 Bogota, 1908. Size 7 × 5, pp. xvi. and 312. *Presented by the Author.*  
 A school text-book, in the body of which the author has eschewed catalogues of  
 names, and has aimed at giving a general description of each country and its  
 inhabitants.
- Mountain-sickness.** *Appalachia* 11 (1908): 350-859. **Workman.**  
 Some Altitude Effects at Camps above Twenty Thousand Feet. By Dr. William  
 Hunter Workman. *Illustrations.*

## NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

## EUROPE.

- Alps.** **Frech.**  
 Geologische Grundlinien der Alpen. Von Prof. Dr. Fritz Frech. Scale  
 1:2,500,000 or 1 inch to 39.5 stat. miles. *Petermanns Mitteilungen*, Jahrgang  
 1908, Tafel 17. Gotha: Justus Perthes, 1908. *Presented by the Publisher.*
- Austria.** **Deutschen u. Oesterreichischen Alpen-Verein.**  
 Karte der Langkofel- und Sellagruppe; Karte der Marmolatagruppe; Karte  
 der Allgauer und Lechtaler-Alpen, östliche Hälfte- und westliche Hälfte.  
 Herausgegeben von der Deutschen und Oesterreichischen Alpen-Verein. Scale  
 1:25,000 or 2.5 inches to 1 stat. mile. Vienna: G. Freytag & Berndt, 1904-  
 1908. *Presented by the Publishers.*
- These tourist maps are similar in style to that of the Brentagruppe noticed in the  
 last number of the *Geographical Journal*, and like that resemble in general appear-  
 ance the sheets of the Swiss Government Survey. Contour-lines at intervals of  
 20 metres are given, on the lower lands in brown, and on the upper rockwork and  
 peaks in black. Although a large amount of detail is given, the work is so finely  
 executed that everything is perfectly legible, the form of the rocks and small ravines  
 being remarkably clear.
- Austria.** **Freytag.**  
 G. Freytag's Touristen-Wanderkarten. Scale 1:100,000 or 1 inch to 1.6 stat.  
 mile. Sheets: 1, Wiener Wald; 2, Schneeberg, Semmering, Raxalpe; 3,  
 Oetscher; 4, Hochschwab; 5, Unteres Ennstal; 6, Ennstal; 7, Wachau, Kamp-  
 tal, Kremstal; 8, Oestliches Salzkammergut; 9, Westliches Salzkammergut;

10, Berchtesgadenland und Pinzgau; 11, Südliches Waldviertel und Donautal; 12, Hohe Tauern; 13, Grazer Bergland. *Prices: sheet 12, 2.50m.; all others, 1.70m.* Touristen-Wanderkarte der Dolomiten. Scale 1:100,000 or 1 inch to 1.6 stat. mile. 2 sheets. *Price 2m.* Karte von Mödling und Umgebung. Scale 1:25,000 or 2.5 inches to 1 stat. mile. *Price 1 kr.* Karte des Semmering und Umgebung. Scale 1:25,000 or 2.5 inches to 1 stat. mile. *Price 1.20 kr.* Vienna & Leipzig: G. Freytag & Berndt, [1908]. *Presented by the Publishers.*

A series of inexpensive maps of districts of Austria frequented by tourists, printed in colours to show relief. Heights are shown by shading and contours. Special attention has been given to railways, roads, paths, and other matters likely to be of interest to mountaineers and tourists.

#### England and Wales.

#### Ordnance Survey.

Sheets published by the Director-General of the Ordnance Survey, Southampton, from October 1 to 31, 1908.

##### 1-inch (third edition):—

In outline, 125, 126, 128, 169, 173, 184. *1s. each* (engraved).

Large sheet series, printed in colours, folded in cover or flat in sheets. 39, 74, 103, 135. *Price, on paper, 1s. 6d.; mounted on linen, 2s.; mounted in sections, 2s. 6d. each.*

##### 6-inch—County Maps:—

**Cornwall** (First Revision), 56 s.e., 63 s.w., 71 n.e. **Kent** (Second Revision), 74 s.w. **Lincolnshire** (First Revision), 5 n.w., s.w., 22 n.w., n.e., s.w. **Pembrokeshire** (First Revision), 4a s.e. **Yorkshire** (First Revision of 1891 Survey), 214 n.e., 215 n.w., 217 s.e., 219 n.e., 230 n.w., 232 n.w., 233 n.w., s.w., 234 s.w., 253 n.w. *1s. each.*

##### 25-inch—County Maps:—

**Hampshire** (Second Revision), LXXX. 14, 15, 16; LXXXI. 13; LXXXVII. 6, 7, 8, 12; LXXXVIII. 1, 2, 3, 4, 8, 10, 11, 14; LXXXIX. 1; XC. 14. **Kent** (Second Revision), X. 14; XVIII. 2; XXIX. 8, 12, 16; XXX. 16; XL. 10, 11; XLI. 1, 5, 9, 10; XLII. 2, 3, 7, 11; LI. 2, 16; LXI. 2, 3, 4, 10, 11, 14, 15; LXII. 13; LXX. 1, 9. **Lancashire** (First Revision of 1891 Survey), LXXXIII. 1, 5, 6, 13; LXXXIV. 3, 6, 10, 12, 13; LXXXV. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 13, 14; XC. 8; XCII. 1, 3; XCIII. 2, 5, 6, 11, 12, 13, 14, 15, 16; XCIX. 10, 12, 13; CIII. 8. **Yorkshire** (First Revision of 1891 Survey), CLXXXII. 7, 8; CLXXXIII. 5, 6, 7, 10, 11; CLXXXV. 6, 7, 10, 11; CXC. 6, 7, 8, 10, 14, 16; CC. 2, 3, 10, 11, 13, 14, 15; CCI. 5, 7, 8, 9, 10, 12, 13, 14, 15; CCII. 9. *3s. each.* CLXXXIII. 15, 16. *1s. 6d. each.*

(*E. Stanford, London Agent.*)

#### England and Wales.

#### Geological Survey.

4 miles to 1 inch. New Series, printed in colours. Solid Edition. Sheet 19: Bath, Guildford, Abingdon, Southampton, etc. *Price 2s. 6d.*

(*E. Stanford, London Agent.*)

#### Norway.

#### Norges Geografiske Opmaalning.

Topografisk Kart over Kongeriget Norge. Scale 1:100,000 or 1 inch to 1.6 stat. mile. Sheet 10 A. Hvaler. Christiania: Norges Geografiske Opmaalning, 1908. *Presented by the Norwegian Geographical Institute.*

#### Turkey.

#### Topographical Section, General Staff.

Map of Turkey. Scale 1:250,000 or 1 inch to 3.9 stat. miles. Sheets: Gallipoli, Mount Athos, Salonika. London: Topographical Section, General Staff, War Office, 1908. *Price 2s. 6d. net each sheet. Presented by the Director of Military Operations.*

### ASIA.

#### Japan.

#### Imperial Geological Survey, Tokyo.

Topographical map of Japan. Scale 1:200,000 or 1 inch to 3.2 stat. miles. Sheets: Aomori, Hitoyoshi, Kamiagata, Sendai, Shimoagata, Suonada, Wajima. Tokyo: Imperial Geological Survey of Japan, 1907-08. *Presented by the Imperial Geological Survey of Japan.*

## AFRICA.

**Algeria.****Service des Cartes et Plans de l'Algérie.**

Carte de l'Algérie. Dressée par ordre de M. Jonnart. Gouverneur-Général de l'Algérie au Service des Cartes et Plans du Gouvernement de l'Algérie. Scale 1:200,000 or 1 inch to 3·2 stat. miles. Sheet 3, Miliana. Algiers: Service des Cartes et Plans du Gouvernement Général de l'Algérie, [1908]. *Price 1 fr. each sheet. Presented by M. R. de Flotte Roquevair, Chef du Service des Cartes et Plans du Gouvernement Général de l'Algérie.*

**Dahomey.****Meunier.**

Carte du Dahomey. Dressée par A. Meunier. Scale 1:500,000 or 1 inch to 7·8 stat. miles. 3 sheets. Paris: Ministère des Colonies, 1908.

This map of Dahomey has been drawn from the surveys and route-traverses of French administrators and officers, of which a list is given under the title. In many parts the country is still unmapped, and much of the topography that is shown is necessarily only based on approximate sketches. The map is printed in colours, and shows the result of survey work up to date.

**Egypt.****Survey Department, Cairo.**

Orographical map of the Nile Basin. Scale 1:2,500,000 or 1 inch to 39·5 stat. miles. 6 sheets. Cairo: Survey Department, 1908. *Presented by the Director-General, Survey Department, Cairo.*

The excellent work of Captain H. G. Lyons, F.R.S., the director of the Egyptian Survey Department, is well known, and his investigations of the region of the Nile are of special value, as may be judged by the instructive paper that has recently been published in the *Geographical Journal*. During these investigations he has naturally paid considerable attention to the land-relief of this part of Africa, and the information gained has thrown fresh light on the orography of certain districts hitherto somewhat erroneously indicated on maps. The orographical wall-map of the Nile basin just published is based upon recent researches, combined with other reliable information, and extends from Victoria Nyanza and the upper part of Tanganyika to the Mediterranean, thus including the whole area drained by the Nile and its tributaries. Relief is shown by a combination of hill-shading and colour-tinting. Land from sea-level to 250 metres is left white, and then, from 250 metres to 2000 metres and over, the height of land is indicated by four shades, ranging from yellow to a reddish-brown, the intervals being 250 to 500 metres, 500 to 1000 metres, 1000 to 2000 metres. Land below sea-level is shown in green, and depths of water by tints of blue. Vertical sections across the region in various directions are given at the foot of the map, which add considerably to its interest. Three important inset-maps of the Nile valley are given on the scale of 1:7,500,000, one showing political divisions, another the distribution of vegetation, and the third the distribution of rainfall. The map measures altogether 7 feet by 4½ feet, and is boldly printed, so that it can be clearly read when hanging on a wall.

**Egypt.****Stanton.**

Provisional map of Khartoum City, Khartoum North, and Omdurman. Compiled for use of the Khartoum Mudiria by Lieut.-Col. E. A. Stanton, Governor Khartoum Province. Scale: 1:253,440 or 1 inch to 4 stat. miles. 2 sheets.

This is a new edition.

**German East Africa.****Moisel.**

Deutsch-Ostafrika. Neubearbeitung von M. Moisel. Scale 1:2,000,000 or 1 inch to 31·6 stat. miles. Berlin: Dietrich Reimer (E. Vohsen), 1908.

**Sierra Leone.****Topographical Section, General Staff.**

Sierra Leone Peninsula. Scale 1:63,360 or 1 inch to 1 stat. mile. London: Topographical Section, General Staff, War Office, 1908. *Price 2s. 6d. Presented by the Director of Military Operations.*

**Transvaal—Pretoria.****Topographical Section, General Staff.**

Map of Pretoria and surrounding country. Scale 1:63,360 or 1 inch to 1 stat. mile. London: Topographical Section, General Staff, War Office, 1908. *Price 2s. 6d. Presented by the Director of Military Operations.*

## AMERICA.

**Argentine Republic.****Buenos Aires Great Southern Railway Company.**

Buenos Aires Great Southern Railway and Connections, 1908. Scale 1:2,000,000  
No. VI.—DECEMBER, 1908.]

2 x

or 1 inch to 31.6 stat. miles. London: The Buenos Aires Great Southern Railway Company, 1908. *Presented by the Buenos Aires Great Southern Railway Company.*

An outline map of Central Argentina and the adjacent part of Chile, showing railways and railway systems from Buenos Aires, with proposed extensions in different colours. The map includes that part of South America from 31° to 42° S. lat. Four plans on enlarged scales are given as insets.

**Brazil—S. Paulo.** *Comissão Geographica e Geologica de S. Paulo.*

Carta Topographica do Estado de S. Paulo. Scale 1:100,000 or 1 inch to 1.6 stat. mile. Sheet: Ouro Fino. S. Paulo: Comissão Geographica e Geologica de S. Paulo, 1908. *Presented by the Comissão Geographica e Geologica de S. Paulo.*

**Brazil—S. Paulo.** *Comissão Geographica e Geologica de S. Paulo.*

Carta Geral do Estado de S. Paulo. Organizada pela Comissão Geographica e Geologica, Eng. João Pedro Cardoso, Chefe. Scale 1:1,000,000 or 1 inch to 15.8 stat. miles. S. Paulo: Comissão Geographica e Geologica de S. Paulo, 1908. *Presented by the Comissão Geographica e Geologica de S. Paulo.*

Chiefly useful as indicating the present condition of railway development in the state of S. Paulo. Rivers are shown in blue, but apart from the names of the ranges there is no indication of hills.

**Brazil.**

*Levasseur.*

Mappa da Republica dos Estados-Unidos do Brazil. Por E. Levasseur. Scale 1:3,000,000 or 1 inch to 47.3 stat. miles. 12 sheets. Paris: C. Delagrave, 1908.

A very roughly drawn map, lithographed in colours, upon which useful information will be found. It is evidently intended to serve as a wall-map, for which purpose important names, boundaries, and main physical features are boldly shown; but, in addition, a considerable amount of detail and many less-important names are given in small symbols and letters, only legible upon close inspection.

**Canada.**

*Topographical Section, General Staff.*

Map of Canada. Scale: 1:63,360 or 1 inch to 1 stat. mile. Sheets: 14, Ottawa; 15, Kemptville. London: Topographical Section, General Staff, War Office, 1908.

*Price 2s. each sheet. Presented by the Director of Military Operations.*

**South America.**

*Bartholomew.*

Commercial map of South America. By J. G. Bartholomew, F.R.G.S. Revised by John Samson, F.R.G.S., of the *South American Journal*. Scale 1:10,000,000 or 1 inch to 157.8 stat. miles. Edinburgh: John Bartholomew & Co., 1908. *Price, mounted on cloth, 3s. net. Presented by the Publishers.*

A new edition of a well-known map of South America, specially useful as showing railways and navigability of rivers. As regards the former, however, further revision is necessary, as instanced by the fact that a railway is shown running round the southern shore of Lake Titicaca which does not yet exist, whilst the line from the south-east shore of the lake to Puno is not indicated at all.

**United States—Kentucky.**

*Filson.*

The First Map of Kentucky, by John Filson. A Bibliographical Account with Facsimile Reproduction from the Copy in the Library of Congress. By P. Lee Phillips. Washington: W. H. Lowdermilk & Co., 1908.

John Filson, the author of this map, was born in 1747, and was killed by Indians in 1788 while prospecting for a town which afterwards became Cincinnati. This map holds an important place in the early cartography of North America, not only from the fact that it was the first map of Kentucky, but also on account of its close association with General Washington, to whom it was dedicated by the author, and to Colonel Daniel Boone, who assisted considerably in its preparation. Great trials and difficulties had to be undergone by John Filson in order to obtain the information for the construction of his map, and many wearisome journeys were undertaken, which at that early date were not unattended with considerable risk; but at length it was finished, and, with his history of Kentucky, was first issued in 1784. As there was no printing-press or method of engraving at that date west of the Alleghenies, Filson journeyed to Wilmington, Delaware, where his book was printed by John Adams, and the map was taken to Philadelphia, where it was engraved by H. D. Purcell, and printed by T. Bock. The reproduction which Mr. P. Lee Phillips has just issued, with explanatory text, is well executed, and will be welcomed by all interested in the history of the United States, especially as the map is decidedly rare, notwithstanding a French reproduction, with the text of the history, and an English reprint, published by Stockdale of London in 1793. Several maps of Kentucky on reduced scales have appeared at different dates, based on Filson's map.

## GENERAL.

World.

Canerio.

Marine Chart of the World, 1502 (*circa*), by Nicolo de Canerio Januensis. Facsimile edited by Edward Luther Stevenson, PH.D., and issued under the joint auspices of the American Geographical Society and the Hispanic Society of America. New York, 1907. Price \$20.

This is the second of the important series of facsimiles of early maps having a special bearing on the discovery of America, which is now being edited by Prof. E. L. Stevenson, and published under the joint auspices of the American Geographical Society and the Hispanic Society of America. A chronological order is not being followed in the publication of these facsimiles, but it is interesting to note that, while the first to appear, that of the World by Jodocus Hondius, exhibits the scope of geographical knowledge possessed at the beginning of the seventeenth century, the present chart shows the extent of that knowledge in the first years of the sixteenth century.

Although portions of this interesting old chart have been previously reproduced, and some years ago the French Government had a few photographs of the whole chart printed, this is the first time that any serious attempt has been made to produce a facsimile on the size of the original, and the result attained is decidedly satisfactory considering the condition of the parchment. Nothing is definitely known of the author of the chart except his name, which appears in the lower left-hand corner, but it is probable that he was one of a number of Italians who found employment as map-makers in Portugal or in Spain in the early years of the discovery of the New World. Nor is the date fixed with certainty; but as there is no original entry of a discovery after 1502, that date has been accepted as approximately correct.

The original from which this facsimile has been made was found in the Archives du Service Hydrographique de la Marine, Paris, where it remains at the present time; and due acknowledgment is made by Prof. Stevenson in the "Critical Study" which he has written to accompany the chart, to M. Hanusse, the director of the Archives du Service Hydrographique, and others who have assisted him in producing this facsimile.

In general appearance this interesting chart resembles other "portulani" of about the same period, but in several particulars it bears striking likeness to the well-known "Cantino" chart. The original is drawn on coarse parchment made up of several sheets joined together. It measures 88 inches by 45 inches, including its border. The work of reproduction by photography has been more than usually difficult owing to the crinkled and bad condition of the parchment. The "Critical Study" gives much interesting information concerning the chart, including a list of the names found upon it compared with those upon the Cantino chart and the Waldseemüller charts of 1507 and 1516. It also gives small photographic reproductions of a few other maps of the fourteenth, fifteenth, and early sixteenth centuries.

World.

Schrader.

L'Année Cartographique. Supplément Annuel à toutes les publications de Géographie et de Cartographie. Dressée et rédigé sous la direction de F. Schrader. Cette dix-huitième année contient les modifications géographiques et politiques de l'année 1907. Paris: Hachette et Cie., 1908. Price 3 fr.

This useful little cartographical annual has now reached its eighteenth year of issue. It consists of three separate sheets of maps illustrative of the principal geographical expeditions in Asia, Africa, and America that have taken place during the year 1907, with explanatory and descriptive text on the back. On the Asia sheet there are five maps, of which the more important are a hypsometrical sketch of Asia Minor, showing heights by five different colour tints, based upon Dr. Richard Kiepert's large map on the scale of 1:400,000, and another showing the new frontier between Siam and Cambodia, from the survey of the Boundary Commission, 1904-07. The Africa sheet contains altogether six maps, the more important being that of the boundary between French Congo and Kamerun; recent French surveys in southern Algeria and Morocco; and a sketch showing the new territorial divisions in southern Algeria. On the America sheet are four maps showing the new frontier between Bolivia and Brazil, the frontier between Colombia and Brazil, according to the arrangement of April 24, 1907, and another giving the results of the recent explorations in the western part of the state of São Paulo, Brazil, by the Geographical and Geological Commission, 1905-07.

## CHARTS.

## Admiralty Charts.

Charts and Plans published by the Hydrographic Department, Admiralty, during September, 1908. *Presented by the Hydrographer, Admiralty.*

## Hydrographic Department, Admiralty.

## New Charts.

No.	Inches.	
3708 m =	2·8	Norway, Christiania fiord:—Drams fiord and Sande bugt. 4s.
3711 m =	{ 4·8	North American Lakes. Plans in Lake Erie:—Erie harbour, Ashtabula harbour, Fairport. 3s.
	{ 9·7	
	{ 9·0	
3705 m =	{ 3·2	Alaska, Chatham strait:—Bay of Pillars, Washington bay. 3s.
3693 m =	{ 6·3	
3693 m =	var.	Plans in Lake Victoria Nyanza:—Munyonyo, Mizinda bay, Bukoba road, Lubembe harbour, Namaungu, Shirati bay. 3s.
3701 m =	{ 2·4	Liu Kiu islands. Plans in Okinawa group:—Iheya islands, Kerama kaikyo. 3s.
	{ 2·0	
2416 m =	0·35	Liu Kiu islands:—Okinawa group. 3s.

## Charts Cancelled.

No.	Cancelled by	No.
2416 Liu Kiu islands. Plan:—	New chart.	
—Kerama channel and anchorage.	Okinawa group . . . . .	2416
	Plan of Kerama kaikyo on new chart . . . . .	3701

## Charts that have received Important Corrections.

No. 1404, Scotland, west coast:—Ardrossan harbour. 2832, Scotland, west coast:—Treshnish point to the entrance of the sound of Mull. 3384, Ireland, south coast:—Queenstown. 201, Adriatic sea:—Sheet I. 1238, Atlantic islands:—South Shetland and South Orkney islands. 2282, Arctic sea:—Arctic ocean and Greenland sea. 373, Plans in the Gulf of Mexico. 1324, South America, east coast:—Rio de la Plata to Cape Dos Bahias. 23, Chile:—Channels between Magellan strait and Gulf of Trinidad. 2839, United States, west coast:—Columbia river.

(J. D. Potter, Agent.)

## Indian Ocean and Red Sea.

## Meteorological Office.

Monthly meteorological charts of the Indian Ocean north of 15° S. lat. and Red Sea, November, 1908. London: Meteorological Office, 1908. *Price 6d. each. Presented by the Meteorological Office.*

## North Atlantic.

## U.S. Hydrographic Office.

Monthly meteorological charts of the North Atlantic and Mediterranean, November, 1908. London: Meteorological Office, 1908. *Price 6d. each. Presented by the Meteorological Office.*

## North Pacific.

## U.S. Hydrographic Office.

Pilot chart of the North Pacific Ocean, November, 1908. Washington: U.S. Hydrographic Office, 1908. *Presented by the U.S. Hydrographic Office.*

## Norway.

## Norges Geografiske Opmaaling.

Kystkarter. Scale 1:50,000 or 1·3 inch to 1 stat. mile. Specialkart B 59, Landegode til Kjerringø og Leines. Specialkart B 78, Gryllefjord og Bergsfjord til Hekkingen. Christiania: Norges Geografiske Opmaaling, 1908. *Presented by the Norwegian Geographical Institute.*

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.













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